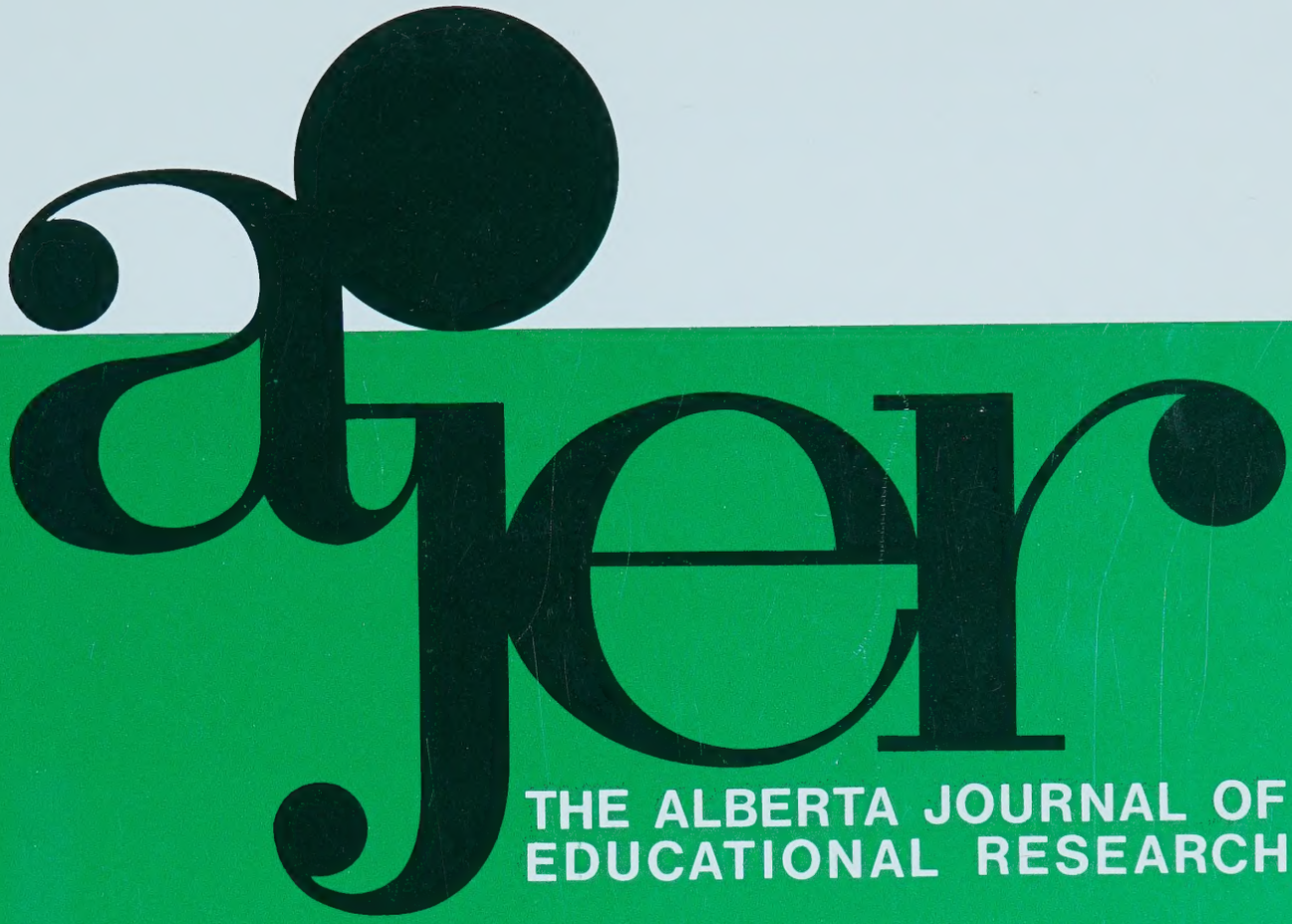

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THE EDITOR'S PAGE

Admonitions for Authors

In publishing Volume XXXI we used about one-quarter of the manuscripts submitted to us. Those which were not used exhibited a number of common characteristics. Reflecting on these characteristics gives rise to some gentle reproofs for prospective authors.

Don't raise doubts about your reliability. Typographical errors, incomplete references, excessive use of abbreviations, and overuse of one type of punctuation, such as dashes, create subliminal doubts about an author's reliability. These doubts are intensified by inconsistencies in the levels of headings, expressions of numbers, and treatment of quotations.

Don't ignore instructions about the preparation of manuscripts. Submitting a single copy of the manuscript without an abstract and a title page, or one which uses the wrong style for references and tables, indicates unfamiliarity with the guidelines about form and style included on the inside cover of the journal. Sending it to a previous editor suggests that you are not a reader of *AJER*. Do you expect to get published in a journal you do not read?

Don't provoke questions about the care taken in conducting the research. Conclusions unsubstantiated by the evidence presented, data in tables which do not agree with the text, and citations in the text not included in the references raise questions about the trustworthiness of the report. Needless jargon, garbled syntax, and ungrammatical constructions also arouse suspicions of muddle-headedness.

Defects like these result in the manuscript being returned unreviewed, sometimes with an invitation to submit a revised version. A further caution grows out of the review process.

Don't evidence the weaknesses frequently identified by reviewers. An introduction which does not make apparent the conceptualization and rationale for the study, or which does not demonstrate the continuity between the study and previous work, is unacceptable. Similarly unacceptable is a discussion section which fails to clarify the similarities and differences between the results of the study and the work of others, or omits an assessment of the contribution of the study. Neglecting to provide a clear summary of what was done and how it was done, or to establish the credibility and dependability of the data collection procedures, elicits criticism bordering on scorn from many reviewers. Likewise disdained is the reporting of data in insufficient detail to justify the conclusions.

How does one heed these admonitions and get an article published? Have the initial version critiqued by an associate, then rewrite it and have someone proofread it. After further revisions and proofreading, submit it.

WHW

The Alberta Journal of Educational Research *Vol. XXXII, No. 2, June 1986, 80-90*

LAWRENCE M. BEZEAU
University of New Brunswick

Level and Inequality of Per Pupil Expenditure as a Function of Finance Centralization

The effect of centralized revenue collection was tested empirically using a sample consisting of the American states and Canadian provinces, while controlling for federal jurisdiction and northern state or territory. It was found that centralization had no effect at all on the level of per pupil expenditure but that relatively less wealthy jurisdictions had more centralized systems. Centralization appeared to reduce the inequality of per pupil expenditure but the magnitude of the effect was small. The centralization variables accounted for only seven percent of the variance of the coefficient of variation of per pupil expenditure. One of the control variables, annual per capita personal income, had a strong relationship with the level of per pupil expenditure but was not related to the variation of per pupil expenditure. Each additional dollar of personal income per capita resulted in an additional 20 cents of per pupil expenditure.

This article examines the level and inequality of annual per pupil expenditure in the public school systems of American states and Canadian provinces as a function of the degree of centralization of financing. In recent decades many states and provinces have assumed a greater share of the financial burden of operating schools frequently with the intention of reducing expenditure disparities among school districts. In other cases the intent has been to increase the amount of financial resources available for education across a state or province. Unfortunately, there is very little evidence to suggest that centralization will achieve either of these objectives. As well there are funding methods available that do not involve centralization and that have the same objectives. There are competing theoretical positions, outlined below, as to whether centralization will increase or decrease the level of expenditure.

Nevertheless, centralization of funding, especially full state assumption, has frequently been perceived as a panacea for interdistrict inequality. Several examples illustrate this. In 1963 in the Province of New Brunswick, the Byrne Commission (Byrne, Andrews, Boudreau, Nadeau, & Wilson, 1963) recommended that the Prov-

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Dr. Bezeau is with the Faculty of Education specializing in educational administration and finance.

ince assume all local costs of education. This recommendation was implemented in 1967 making New Brunswick the second full state assumption jurisdiction in North America. In 1969 the United States Advisory Commission on Intergovernmental Relations decided that full state financing was the most likely way to attain equal educational opportunity. In 1972 in the State of New York, the Fleischmann Commission (*The Fleischmann Report*, 1973) recommended that the State move to full state assumption over a period of three years. This recommendation has not yet been implemented and appears unlikely to be implemented in the near future.

There has been some comment from the academic community on full state assumption but as Benson (1975, p. 7) acknowledges, currently available examples may not be very instructive. Much of this comment is necessarily speculative. After examining various funding schemes other than full state assumption, Cooper (1971, p. 351) concluded that, "Unless our national conscience can come to tolerate a proliferation of enclaves of educational privilege alongside enclaves of underprivilege, we must move in the direction of state assumption of the full costs of elementary and secondary education." The few empirical studies of full state assumption jurisdictions indicate that even centralization taken to its logical extreme has not entirely eliminated inequity (Hight, 1974).

This study has both a theoretical and a practical purpose. On a practical level, we need to know if centralization has achieved the objectives that decision-makers expected. Is it positively related to higher expenditure levels and greater equality of expenditure? On a theoretical level the study addresses the question of which of the two theories best explains the empirical results. The spillover model, in particular, has recently been employed to explain economic and financial phenomena in the area of education. This is a departure from its traditional role of explaining relatively pure public goods such as defence and justice.

This study employed cross-sectional data for the 1979-80 school year to explore the two relationships posed above. In practice the centralization of revenue collection is often accompanied by other changes which frequently include the centralization of control and administration; but only the issue of finance is addressed here. In particular, issues of allocative efficiency, community preferences, local control, and organizational accommodation are not dealt with. These issues are discussed to a limited extent in Wallschlaeger (1973) and Johns (1973).

Competing Models of Centralization

Two theoretical models produce opposite predictions of the effect of centralization of revenue collection on the level of per pupil expenditure. The spillover model predicts that higher per pupil expenditure will result from greater centralization while the personal service model predicts higher expenditure as a consequence of greater decentralization. Centralization is often seen as a means of obtaining greater equality of per pupil expenditure, but there are financing systems designed to achieve the same result without centralization.

The model which is here referred to as the spillover model is based on the presumed public-good properties of education (Brazer, 1970). Education is assumed to have benefits that cannot be captured by the individual receiving the education. These are difficult to specify but may include good citizenship, neighborliness, lowered propensity to commit crimes, national unity, social cohesion, and more effective raising of children. Society as a whole receives these benefits and the

individual responsible for the benefit cannot charge others for his or her contribution. Since educated individuals do not receive all the benefits of their education, if they are left to finance their education from their own resources they will underinvest. Milton Friedman (1962, pp. 85-107) refers to these benefit spillovers as neighborhood effects and uses them to justify some government intervention in financing education. To prevent such underinvestment the community must organize, impose taxes on itself, and subsidize education as most communities do.

Although the community receives the public benefits of the individual's education, it may not be the same community as the one that subsidized this education. Some of the benefits accrue to the larger community: the state or nation. Also individuals are geographically mobile; they may leave the local community that educated them, depriving it of the public benefits of their education. Individuals are not as likely to leave their state of origin and even less likely to leave their country. Thus many of the benefits that are external to the local community are internal to the state or nation. The benefits that arise from costs borne in a given jurisdiction that are external to the jurisdiction are called benefit spillovers. Education benefit spillovers discourage a jurisdiction from investing in education. States and nations, because they are able to internalize a higher proportion of the benefits, can be expected to invest more heavily in education. Thus we would expect to find those states and provinces with greater state or provincial and federal financial involvement to spend more on education and those with greater local school board financial involvement to spend correspondingly less.

A recent study by Hadley (1985) employed the spillover model with American states to predict that educational expenditure would be affected by migration patterns in and out of the individual states. He controlled for per capita income and found that this variable had a very strong effect on per pupil expenditure but that the migration variables made no significant difference. He reanalyzed the data of an earlier study that had reached the opposite conclusion and found that the apparently contradictory results were caused by a high correlation between migration rates and per capita income which made it difficult to distinguish between the two.

The personal service model assumes that education is something that individuals will invest in more heavily if they can invest in themselves or in their local community rather than in a larger aggregate. This model has most frequently been used to characterize health services and to explain low service levels in countries with government-financed health insurance. Individuals are believed to be more willing to spend money on their own health than on the health of the nation as a whole.

Hickrod (Final Report, 1973, p. 105), in a dissenting note to a report recommending full state assumption for the State of Illinois, described a mechanism whereby decentralized revenue collection may contribute to higher levels of per pupil expenditure. Wealthier districts increase their expenditures which motivates the educational community to pressure state governments into helping the poorer districts to catch up with them. With full state assumption this mechanism would disappear, perhaps causing the state to construe uniformity as adequacy.

Lake (1983, 1982) implicitly applied the personal service model to education in suggesting that full state assumption in the Province of New Brunswick has reduced the sufficiency of education finance in comparison with Nova Scotia. His sample of only four jurisdictions did not permit him to test this hypothesis, but he and others before him have noted low per pupil expenditures in full state assumption jurisdictions.

With respect to the effect of centralization on equality of per pupil expenditure, there are expectations that the way to reduce inequality is to centralize revenue collection at the state or provincial level and to hand out the revenue equitably without regard to local ability to pay. It is nevertheless possible to equalize the ability to pay without centralization. Revenue sharing schemes such as guaranteed valuation, percentage equalizing, and especially district power equalizing, permit equalization of the ability to finance education without necessarily centralizing revenue collection (Jargowsky, Moskowitz, & Sinkin, 1977). Using a power equalizing approach it is possible, in theory at least, to achieve complete interdistrict equality of financial ability without any state or provincial contribution at all. This is done through recapture provisions with redistribution of recaptured revenue in such a way that a simple relationship exists between the district choice of tax rate and a level of per pupil expenditure, a relationship that is the same for all districts in the jurisdiction. The level of per pupil expenditure is determined only by the willingness of the district to tax itself and not by its ability to pay.

Sample

The unit of analysis is the highest subnational jurisdiction, the state in the United States and the province in Canada. Because of the similarity of education finance in the two countries, the states and provinces were analyzed together whenever data availability permitted. Both countries are federations with the states and provinces as the governmental units constitutionally responsible for education. Much of this responsibility has been delegated to locally-elected school boards which have the authority to levy a tax on real property in most states and provinces. In both countries the federal government makes categorical grants to elementary and secondary education, but this is the level which provides the least amount of money.

The two countries together provided a sample size of 62 jurisdictions. This included all American states and the District of Columbia. The District of Columbia was treated as a school district without a state and Hawaii, the only full-state-assumption jurisdiction in the United States, as a state without school districts. All ten Canadian provinces were included but the two Canadian territories were lumped together as one jurisdiction. The two full-state-assumption jurisdictions in Canada, New Brunswick and Prince Edward Island, have systems of school districts and so were treated normally.

Data were obtained from published and unpublished sources, the National Center for Education Statistics in the United States and from Statistics Canada in Canada. NCES provided data disaggregated by school board whereas financial data for individual boards were not available for Canada. This prevented the calculation of inequality measures for Canadian provinces. All 62 jurisdictions are included in the level of expenditure analysis but only 49 American jurisdictions are included in the inequality analysis. Of the American jurisdictions, the District of Columbia and Hawaii were excluded from the inequality analysis because without two or more school districts, it is impossible to calculate a measure of inequality.

Methodology

Multiple linear regression was used for both the level of expenditure analysis and the inequality analysis. The dependent variable in the level of expenditure analysis was the pupil-weighted mean of annual per pupil expenditures of school districts in each jurisdiction. The dependent variable in the inequality analysis was the pupil-weighted coefficient of variation of this mean. Per pupil expenditure was defined as total recurrent expenditure exclusive of food services and transportation, which corresponds to the National Center for Education Statistics concept of core current expenditure. The coefficient of variation was calculated by dividing the weighted standard deviation by the weighted mean. Although numerous other measures of inequality are possible, the voluminous literature on this topic (Bezeau, 1979; Love & Wolfson, 1976; Sen, 1973) suggests that the coefficient of variation is free of the undesirable properties that characterize many popular measures while being relatively easy to understand and explain. In the calculation of these measures, the several hundred school boards in North America that send all their students to other boards for education were excluded in order to avoid double counting. All dollar amounts used were current and were expressed in United States dollars for both countries.

The independent variables were classified as control variables and experimental or centralization variables. The control variables were federal jurisdiction, northern jurisdiction, and annual personal income per capita. The centralization variables were proportions of revenue provided by the local, the state or provincial, and the federal levels.

In general, the control variables describe phenomena that are likely to influence the dependent variables but are logically and temporally prior to them. Federal jurisdiction was used to control for the higher average per pupil expenditure in Canada. The northern jurisdiction variable controlled for the much higher per pupil expenditure in the Canadian territories and Alaska. Annual personal income per capita was used as a measure of the ability of the jurisdiction to finance education. In studies reviewed by Hadley (1985), this variable is shown to be superior in predicting educational expenditures than other related ones such as income per child in public school.

The three centralization variables must be classified as representing centralization or decentralization in order to structure the regression equations and interpret the results. Because of the minimal level of participation of the federal level in both countries, centralization is seen primarily as a question of local versus state or provincial contribution. The state proportion, therefore, represents centralization and the federal proportion must also represent centralization. This leaves the local proportion to represent decentralization. Since the three proportions add to one, it was not possible to enter all of them into one regression equation. Local proportion was entered into the first equation and state and federal proportion were entered into the second equation.

The regressions were unweighted, the rationale for this being that the independent variables of concern, the centralization variables, characterize jurisdictions rather than pupils, revenue amounts, or populations. Because of this, caution must be exercised in interpreting some of the descriptive statistics. The arithmetic means in the tables are averages across jurisdictions. To obtain a revenue proportion for Canada and the United States together, for example, it would be necessary to weight each jurisdiction's proportion by the total revenue for education of that

jurisdiction. This was not done. Likewise to obtain the mean per pupil expenditure for all pupils in the sample it would be necessary to weight each jurisdiction's per pupil expenditure by the number of pupils.

Additional analyses, not reported here, were performed using several nonlinear models and various standard variable transformations. These analyses included the calculation of elasticities. In no case were the results superior to those produced by the relatively simple linear model reported here.

Level of Expenditure Results

Results for annual per pupil expenditure as the dependent variable are given in Tables 1 and 2. First order relationships are examined first as they provide information which is required to interpret the regression results. The control variables show the expected correlation with the dependent variable; northern and Canadian jurisdictions have a higher annual per pupil expenditure and those with a higher per capita personal income spend significantly more on education. Unexpectedly, personal income correlates strongly with two of the centralization variables. Local proportion correlates positively with personal income and state proportion correlates negatively. We can conclude that those states and provinces with lower personal income per capita are the ones that have chosen to centralize education finance. The wealthy jurisdictions have retained decentralized systems. In view of the fact that the wealthy jurisdictions also spend more on education, it is of crucial importance in the regression analysis to control for some measure of wealth before judging the effect of the centralization variables on per pupil expenditure.

The federal proportion, which averages less than 10%, is not related to personal income but the overall correlation coefficient hides important differences between the two countries. The coefficient for personal income for the United States is –0.41, suggesting a federal policy of using categorical grants for education for equalization purposes. The coefficient of 0.04 for Canada indicates no such policy. Federal proportion has a significant negative correlation with per pupil expenditure even though the state and local proportions do not correlate at all with this variable.

The signs on the regression coefficients in Table 2 are consistent with the personal service model, but the standard errors of the centralization variables are far too high to permit this conclusion or the opposite conclusion. The regression itself is highly significant with almost 80% of the variance in per pupil expenditure predicted by the independent variables, but the three control variables (NORTH, USA, and PINC) account for slightly more than 79% leaving less than one-half percent for the centralization variables. An examination of regression results and residuals for individual jurisdictions supports the conclusion forced upon us by the regression equations, that centralization of revenue collection or the lack of it has no effect on the level of per pupil expenditure.

Personal income per capita accounts for 28% of additional variance after the entry of NORTH and USA. An additional dollar of personal income per capita results in about 20 additional cents of per pupil expenditure. In the case of the comparison between New Brunswick and Nova Scotia, the only variables that differ are the personal income and centralization variables. Using the regression equation, Nova Scotia's higher per capita personal income produces a per pupil expenditure difference of $128. The actual difference is only $75. The difference in per pupil expenditure between the two provinces is more than explained by the difference in wealth. This contradicts Lake's (1983) hypothesis described earlier.

Table 1
Descriptive Statistics and Correlation Coefficients for Annual Per Pupil Expenditure and all Independent Variables for 62 American and Canadian Jurisdictions

Descriptive Statistics

Variable Name	Mean	Standard Deviation	Description of Variable
PPEX	1958.954	514.317	Annual per pupil expenditure
NORTH	0.032	0.178	Northern state or territories Alaska and Can. territories = 1.0; Others = 0.0
USA	0.823	0.385	Federal jurisdiction USA = 1.0; Canada = 0.0
PINC	8934.050	1474.880	Personal income per capita
LOPR	0.399	0.188	Local proportion of revenue
STPR	0.506	0.195	State proportion of revenue
FDPR	0.095	0.049	Federal proportion of revenue

Correlation Coefficients

	PPEX	NORTH	USA	PINC	LOPR	STPR
NORTH	0.712					
USA	−0.151	−0.154				
PINC	0.611	0.236	0.394			
LOPR	0.026	−0.278	0.421	0.431		
STPR	0.053	0.304	−0.552	−0.407	−0.968	
FDPR	−0.312	−0.143	0.579	−0.036	0.010	−0.259

$|r| > 0.211$ is significant at the 0.05 level.
$|r| > 0.296$ is significant at the 0.01 level.

Table 2
Regression Results for Annual Per Pupil Expenditures as Predicted by Local, State, and Federal Proportions of Revenue for 62 American and Canadian Jurisdictions

Regression Results with Local Proportion of Revenue

Multiple R	0.890	R squared	0.793
F value	54.495	Significance of F	0.0000
Standard error of estimate			242.239

Variable Name	B Coefficient	Standard Error	Beta Coefficient	Significance of Coefficient
NORTH	1563.784	201.715	0.5416	0.0000
USA	−432.291	93.297	−0.3237	0.0000
PINC	0.204	0.027	0.5838	0.0000
LOPR	168.964	207.731	0.0617	0.4194
(CONSTANT)	378.022	198.526		0.0619

Dependent variable is PPEX.

Regression Results with State and Federal Proportions of Revenue

Multiple R	0.891	R Squared	0.794
F value	43.168	Significance of F	0.0000
Standard error of estimate			243.635

Variable Name	B Coefficient	Standard Error	Beta Coefficient	Significance of Coefficient
NORTH	1559.378	203.014	0.5401	0.0000
USA	−383.458	125.048	−0.2872	0.0033
PINC	0.200	0.028	0.5721	0.0000
STPR	−140.153	214.543	−0.0530	0.5163
FDPR	−650.642	841.656	−0.0615	0.4427
(CONSTANT)	573.269	316.017		0.0750

Dependent variable is PPEX.

Inequality of Expenditure Results

Table 3 shows somewhat weaker first order relationships for the coefficient of variation analysis than were found for the level of expenditure analysis. Personal income per capita correlates positively with the coefficient of variation. While this relationship is statistically significant, it is not strong. None of the three centralization variables shows significant relationships with the coefficient of variation.

Table 3
Descriptive Statistics and Correlation Coefficients for Coefficient of Variation of per Pupil Expenditure and all Independent Variables for 49American Jurisdictions

Descriptive Statistics

Variable Name	Mean	Standard Deviation	Description of Variable
CV	0.195	0.096	Coefficient of variation of annual per pupil expenditure
NORTH	0.020	0.143	Northern State; Alaska=1.0; others=0.0
PINC	9118.900	1291.027	Personal income per capita
LOPR	0.437	0.155	Local proportion of revenue
STPR	0.458	0.137	State proportion of revenue
FDPR	0.105	0.039	Federal proportion of revenue

Correlation of Coefficients

	CV	NORTH	PINC	LOPR	STPR
NORTH	0.535				
PINC	0.248	0.427			
LOPR	0.116	−0.236	0.235		
STPR	−0.099	0.281	−0.082	−0.972	
FDPR	−0.118	−0.045	−0.647	−0.570	0.361

$|r| > 0.238$ is significant at the 0.05 level.
$|r| > 0.332$ is significant at the 0.01 level.

The coefficient of variation of per pupil expenditure proved to be much more difficult to predict with the variables used here than was the level of expenditure. Although both the regressions reported in Table 4 are significant, less than 36% of the variance is predicted in each case. NORTH shows a strong positive relationship to the coefficient of variation, but the relationship between personal income per capita and the coefficient of variation is small and insignificant.

The regression coefficients on the centralization variables suggest that greater centralization is associated with greater equality but the effect is small. Local

Table 4
Regression Results for Coefficient of Variation of Annual per Pupil Expenditure as Predicted by Local, State, and Federal Proportions of Revenue for 49 American Jurisdictions

Regression Results with Local Proportions of Revenue

Multiple R	0.596	R squared	0.355
F value	8.251	Significance of F	0.0002

Standard error of estimate 0.079

Variable Name	B Coefficient	Standard Error	Beta Coefficient	Significance of Coefficient
NORTH	0.429	0.098	0.6400	0.0001
PINC	−5.386E-06	1.383E-05	−0.0727	0.6988
STPR	−0.189	0.096	−0.2704	0.0550
FDPR	−0.094	0.436	−0.0383	0.8311
(CONSTANT)	0.332	0.160		0.0439

Dependent variable is CV.

Regression Results with State and Federal Proportions of Revenue

Multiple R	0.596	R Squared	0.355
F value	6.067	Significance of F	0.0006

Standard error of estimate 0.080

Variable Name	B Coefficient	Standard Error	Beta Coefficient	Significance of Coefficient
NORTH	0.429	0.098	0.6400	0.0001
PINC	−5.386E-06	1.383E-05	−0.0727	0.6988
STPR	−0.189	0.096	−0.2704	0.0550
FDPR	−0.094	0.436	−0.0383	0.8311
(CONSTANT)	0.332	0.160		0.0439

Dependent variable is CV.

proportion of revenue has a positive relationship with the coefficient of variation which reaches significance at the 0.05 level. The state proportion of revenue has a negative coefficient which just fails to reach significance at that level. The federal proportion is unrelated to the coefficient of variation.

The magnitude of the centralization effect on the coefficient of variation is not great. A reduction of 10 percentage points in the local share reduces the coefficient of variation by 0.018 which is less than one-fifth of a standard deviation. If Oregon, the jurisdiction with the second highest coefficient of variation, reduced its local proportion of 0.57 to zero this would reduce its coefficient of variation from 0.49 to 0.39. This would only change its coefficient of variation rank from second to fourth.

The two control variables account for 29% of the variance in the coefficient of variation while the centralization variables contribute an additional seven percent. Although this seven percent is statistically significant, centralization of revenue

collection cannot be recommended as a policy intended to reduce expenditure inequality among school districts when 93% of the variance will be unaffected by whatever policy changes are made. An inspection of individual cases confirms that centralized revenue collection is neither a necessary nor a sufficient condition for equality of per pupil expenditure.

Conclusions

The empirical results do not support either the spillover model or the personal service model of education. Centralization of revenue collection does not consistently increase or decrease per pupil expenditure, but those jurisdictions with lower per capita personal income have chosen in disproportionate numbers to centralize their education finance systems. This may have given the impression that centralization leads to lower expenditure. Per pupil expenditure is well predicted by annual per capita personal income, but after controlling for this variable, the centralization variables show no relationship with per pupil expenditure. Any government policy which is intended to increase the adequacy of education finance can ignore this variable altogether.

These results combine with those of Hadley (1985) to cast doubt on the usefulness of the spillover model in explaining the finance and supply of education. The success of this model in explaining the provision of relatively pure public goods has not been duplicated for education. There are several possible reasons. To start with, there are the substantial private benefits of education exemplified by the higher incomes of educated persons and their generally better working conditions. Another possible factor is the embodiment, in the educated individual, of the investment in his or her education. Traditional public goods such as defence are not embodied in individuals in this way.

The importance of per capita personal income as a predictor of per pupil expenditure has been confirmed by this study. Each additional dollar of personal income resulted in an additional 20 cents of per pupil expenditure.

Centralization of revenue collection leads to more equality of per pupil expenditure among school districts but the magnitude of this effect is not impressive. The centralization variables account for only seven percent of the variance of the coefficient of variation. For this reason, centralized revenue collection by itself cannot be recommended to political decision-makers as a means of achieving greater equality.

Additional research needs to be done to account for the 65% of the variance in the inequality of per pupil expenditure which is not accounted for in the research reported here. Equality of opportunity continues to be an important policy variable, but the research results currently available on the determinants of expenditure inequality are not very helpful to policy-makers.

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An Examination of Private School Issues in Alberta

When private schools benefit from public funding, any growth in the private education sector attracts particular attention during a time of enrolment decline in the public schools and of economic restraint. An examination of the opinions of school superintendents, board chairmen, and private school principals indicates some divergence of views with respect to issues such as the historical relevance of private schools, freedom of choice among alternatives, public control of private schools, and the commitment of parents, teachers, and students to their respective schools. Considerable consenses was found regarding such issues as freedom of choice and cause for a critical assessment of public education in the face of growing interest in private schools.

The purpose of this study was to ascertain and compare the opinions of superintendents and school board chairmen of public and separate school districts, and of principals of private schools with respect to current private school issues in Alberta. An earlier study examined the private school movement in Alberta (Bergen, 1982). Several findings from that study are reexamined here. That study also provided a review of selected writing and research on private schools, including four decades of writing on private education in the province of Alberta.

Recent studies regarding private education in Alberta are those of Digout (1969), Sloan (1980), Treleavan (1981), Baergen (1982), and Larsen (1984). Digout outlined the events which led to the introduction of public funding for private schools. Sloan traced the events and legislation leading to the provision of "umbrella" agreements by which a private school could operate largely as an alternative school under a public school board. By means of a delphi study, Treleavan consolidated the opinions of 39 "knowledgeables" representing private school associations, teacher and school trustee associations, school superintendents, Department of Education officials, and politicians. Private schools were not perceived to be a threat to public education, however public financial support was seen as leading to some political conflict. Also, the government policy was perceived to be

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favoring developments in private education. This latter perception appears to be made explicit in various statements and documents current in 1985.

Baergen (1982) examined secondary private school policies and manuals. He found some of these to contain exclusive admission policies. He questioned the restricted academic programs offered by most of the schools, and suggested that private schools should receive reduced grants according to the extent that they differ from public schools. Larsen's (1984) study was undertaken for a county school committee which wanted a survey of opinions regarding its public schools with the intent of meeting the needs and concerns of its resident school population in such a manner that interest in private schools would decline. Apparently the committee's effort proved to be successful.

Context

The first schools in colonial Canada were private and most of these were established by Catholic and Protestant denominations. As public school systems evolved, a number of private schools continued to exist. At the same time, denominationalism remained a characteristic of provincial school systems. Religious exercises for schools were prescribed in all provinces, and religious instruction was permitted according to local choice in all but British Columbia.

One province (Quebec) had two denominational school systems, and another (Newfoundland) several. These constituted the provincially supported "public" schools. In three provinces (Ontario, Alberta, and Saskatchewan) provision was made for "separate" schools as part of the public school system. These separate schools could be organized by the minority denominational group within a school district. According to the Canadian constitution of 1867, these were defined as either "Catholic" or "Protestant." Generally, non-Catholic schools have been referred to as public schools and the Catholic schools as separate schools. Both categories are distinct from private or independent schools. The remaining five provinces have "nonsectarian" schools only. The public schools, at one time predominantly of Protestant hue (Patterson, 1970; Stamp, 1970), over time became secularized. Some parents who might have found the public schools of fifty years ago quite acceptable, today find their secularization excessive. This, in part, accounts for an increased interest in denominational private schools, a trend which currently is causing some concern among public school supporters.

Concern about private schools has evoked considerable debate in the province of Alberta. The Minister of Education engaged the Canadian Gallup Poll to survey public attitudes and opinions about education generally, including those about private schools. The opinion survey was published in May 1984. The Minister also appointed a Committee on Tolerance and Understanding to examine the instructional content of public and private schools and a private consulting firm to make an extensive survey of private schools in the province. Both reports were made public early in 1985. Findings of these reports which are related to this study are discussed later. Also, the Minister's Policy Advisory Committee for the School Act Review (1985) received briefs in response to its "principles" which included provisions for private schooling.

In Canada, private schools are not a national concern except insofar as a part of the fees paid to private schools are submitted for income tax deductions. Newfoundland and Prince Edward Island currently have no operating private schools, and very few exist in Nova Scotia and New Brunswick. Concerns are raised in

provinces where partial funding of private schools has been introduced, namely the four western provinces and Quebec. The Davis proposal of extending funding to senior high school grades for Ontario Catholic Separate Schools, grades which had been offered on the basis of private school fees, provoked renewed discussion regarding public funds for private schools generally. Subsequently a commission on private schools was appointed and has since completed its recommendations (Shapiro, 1985). To date, a limited number of studies on private schools, generally restricted to the individual provinces, are available. The study reported herein adds to the examination of concerns within one province. This provincial focus is not unusual. Structures, laws, and funding formulas differ sufficiently from province to province to make interprovincial comparisons very difficult. However, an accumulation of provincial studies may precede an interprovincial study of private schools still to be undertaken.

Method

A first questionnaire was mailed to all public school superintendents in November 1983 in order to determine the perceived extent of private school developments in the jurisdictions of the respondents. The distribution and return of questionnaires is shown in Table 1. This questionnaire was not mailed to separate school superintendents because private schools have to date not caused any noticeable drain of students who are residents of separate school districts. There are, however, some Catholic parents who have enrolled some of their children in non-Catholic private schools. Also, since 1982 one private Catholic school has been operating in Edmonton. Its students are residents mainly of the Edmonton Separate School District. As separate school districts are geographically coterminous with public school districts, separate school superintendent returns would have duplicated much of the same information.

Table 1
Distribution and Return of Questionnaires to Public School Superintendents

Category	Delivered	Returned	% Return
City Districts	9	8	88.9
Town Districts	9	9	100.0
Village & Rural Districts	11	4	36.4*
Divisions & Counties	60	49	81.7
Total	89	70	78.7

* A probability exists that some small school districts were being served by superintendents of other or larger school systems, and that each respondent completed only one return covering all jurisdictions under his direction.

A second questionnaire was mailed to a sample of both public and separate school superintendents, to public and separate school board chairmen, and also to a

sample of private school principals. The respondent sample comprised half of the superintendents of the province, the school board chairmen of the same constituencies, and principals from half of the private schools. The latter comprised a selected sample in order to assure representation from various categories of private schools. Superintendents and board chairmen were selected in such a manner that approximately every other school board jurisdiction across the width and length of the province would be represented. In all, 169 questionnaires were mailed, and 74 were returned, as detailed in Table 2. All questionnaires were mailed to the respondent groups towards the end of November 1983. Most returns were received by the end of January 1984.

Respondents were asked first whether they agreed or disagreed with each of a set of 15 statements. Next, they were asked to provide written reasons for their responses. The first set of responses were tabulated according to the type of school jurisdiction. Each written response was assessed by a second researcher in order to arrive at agreement with respect to the appropriateness of its categorization and tabulation.

Table 2

Distribution and Return of Questionnaires

Category	Delivered	Returned	% Returned
Public School Superintendents	40	20	50.0
Separate School Superintendents	24	13	54.2
Public School Chairmen	40	15	37.5
Separate School Chairmen	24	7	29.2
Private School Principals	41	19	46.3
Total	169	74	43.8

Findings

Perceived Extent of Private School Development in Public School Jurisdictions

The initial part of the first questionnaire to public school superintendents concerned the extent of private school developments in the jurisdictions of the respondents. Table 3 summarizes these responses. Twenty-three of the 70 responding superintendents indicated that no private schools were located in their jurisdictions. Nineteen reported the existence of category one private schools (those employing certificated teachers and receiving government grants), 15 reported category four private schools (probably not employing certificated instructors), and 18 the existence of unauthorized operating private schools. As category two and three private schools (special schools for the handicapped and second language schools for the instruction of a second language during hours outside of the regular school day) do not cause a reduction in regular school enrolment, no enquiry was made regarding such schools.

Table 3
Extent of Private School Developments as Reported by Responding Public School Superintendents

Item	School Jurisdiction Subcategory			Totals
	Urban	Nonurban/Rural		
	City/Town	Private Schools located in district	Private Schools *not* located within district	
No. of returns	21	26	23	70
No. reporting cat. 1 private schools	6	13	0	19
No. reporting cat. 4 private schools	3	12	0	15
No. reporting unauthorized schools	3	15	0	18
No. reporting private schools (any cat.)	9	26	0	35
Total No. of cat. 1 schools reported by all respondents	15*	20*	0	35*
Total. No. of cat. 4 schools reported by all respondents	5*	18*	0	23*
Total No. of unauthorized schools reported by all respondents	6*	17*	0	23*
Total No. of private schools reported (any category)	26*	55*	0	81*
No. reporting loss of students to private schools	14	26	10	50
Range in No. of grades 1-9 pupils lost by public school systems	10-500**	6-470**	5-25***	
Range in the No. of grades 10-12 students lost by school systems	7-200**	2-250**	1-15***	
No. reporting formal and/or informal arrangements with private schools	2	2	0	4

* These numbers may be inaccurate; superintendents may not be aware of the actual status of every private school located within their jurisdictions, nor may they have an accurate count of the total number of operating private schools.

** Estimates

*** Pupils attending private schools outside of the reporting superintendents' jurisdictions.

The returns suggest that about one-third of all private schools are located in urban centers. Fifty respondents reported a loss of students to the private schools. For some the numbers were quite small; however, in some jurisdictions estimates ranged as high as 500. It is also apparent that the summary may not include Edmonton, where more than 1,000 students attend private schools. (Alberta College alone enrolls about that many, though most of these might be adult students who would not be attending a regular high school.) At least 12 superintendents from larger school systems did not respond. A total response might have reported more than 100 operating private schools even though all superintendents may not be aware of the precise number of such schools in their jurisdictions.

Four superintendents reported arrangements with private schools. These included the following: private school students having access to the music program in a junior high school; busing of students to private schools; loan of some instructional materials; tuition agreements; and a cordial relationship in that invitations to school programs are accepted. Sixty-three of the 70 respondents reported that no relationship of any kind was observed with respect to private schools.

Superintendents responded to questions concerning the impact of private schools as follows:

1. *The nature of the impact of private schools upon the programs of the public schools.*

Sixty-four of the 70 superintendents responded to this item. Little or no impact was reported by 33 of the superintendents. A loss of grant revenue and/or curtailment of school programs was reported by 13. The most serious consequences were suffered by small districts.

2. *Foreseen future private school developments in jurisdictions.*

Fifty-nine superintendents responded to this item. Of these, 28 reported no foreseen developments. However, further developments were anticipated in half of the jurisdictions in which private schools had been established, and interest in private schools was anticipated in five of the 23 jurisdictions which did not contain private schools.

Respondent Views Regarding Statements About Private Schools

A set of 15 statements were formulated, each of which appeared as a reasonable assumption based on an earlier study on the development of private education in Alberta (Bergen, 1982). Table 4 details for each respondent group the percent of respondents *agreeing* with each statement. Selected comments are quoted in order to portray the diversity of views. Any one comment need not, but in several instances does, represent the majority view of the group.

Comments are identified according to the category of the respondents as follows:

PS—public school superintendent
SS—separate school superintendent
PC—public school board chairman
SC—separate school board chairman
PP—private school principal

1. *Historical roots have relevance in current decisions about the place of private and alternate schools in the context of a provincial education system.*

Most respondents agreed with this statement, the lowest proportion (68.2%) being for board chairmen. Numerous comments (18), in greater proportion by separate school superintendents and private school principals, were made with reference to human rights and religious convictions. Public school superintendents and board chairmen generally made comments (16) to the effect that present conditions should take precedence over historical factors.

Woods Gordon (1984) found "no reason to disallow private schools from continuing to operate in Alberta" (p. 17).

Selected comments

What is important is the present situation—the rights of individuals and/or groups. (SS)

Table 4
Percent of Respondents Agreeing With Statements Relating to Private Schools

Statement	Respondent Group			
	Public School Supts. N=20	Separate School Supts. N=13	School District Chairmen N=22	Private School Principals N=19
1. Historical relevance	85.0	84.6	68.2	94.7
2. Freedom of choice	70.0	92.3	86.4	94.7
3. Useful function	65.0	100.0	72.7	100.0
4. Grants to private schools	40.0	69.2	54.5	89.5
5. Constitutional precedence	35.0	76.9	59.1	89.5
6. Cause for assessment of public education	75.0	92.3	95.5	89.5
7. More provincial control	85.0	100.0	95.5	42.1
8. Need for advance notice to district boards	95.0	92.3	100.0	47.4
9. Need for undiminished grants to district boards	85.0	76.9	72.7	15.8
10. Private schools be responsible to district boards	60.0	61.5	63.6	21.1
11. Open admission policy for private schools	100.0	61.5	90.9	42.1
12. Uncertificated teachers acceptable in private schools	30.0	46.2	9.1	36.8
13. Commitment of public relative to private school teachers	60.0	53.8	68.2	26.3
14. Commitment of public relative to private school parents	30.0	46.2	50.0	15.8
15. Commitment of public relative to private school students	50.0	61.5	50.0	21.1

Catholic Separate School Systems and/or Protestant Separate School Systems *only*, have historical roots that should be considered in any "dual" country, for example, Bilingual and Bicultural. (PC)

Indeed historical roots *have* relevance. Too many of us have failed to understand or appreciate the history of private schools which predate our province! (SC)

Private schools are not a new phenomenon in Alberta or elsewhere in the world for that matter. Throughout recent history Christian schools have been educational leaders, only later to be replaced by state education. (PP)

2. *The freedom of parent and/or student choice—particularly in the context of the Canadian Charter of Rights and Freedoms—has relevancy in private and public education.*

Most respondents agreed with this statement, with the lowest proportion (70%) being for public school superintendents. Comments (18) supported freedom of choice as an accepted principle. Statements of concern (15) relating to standards and the protection of the student were made in greater number by public school superintendents.

According to the Gallup Poll (1984), 93% of all respondents supported the right of parental choice. Woods Gordon (1984) also found general support of the right of parents to choose the school. The Minister's Advisory Committee (1985), in enunciating principles for a new school act, acknowledged that schooling may occur "outside of a conventional school," and that parents may be choosing "other than a public or separate school" (p. 11).

Selected comments

Freedom of choice is an accepted principle of our democratic society. (PS)

None of the rights which were entrenched in the B.N.A. Act of 1867 regarding private and separate schools have been changed in any way by the Canadian Charter of Rights. (SS)

Children are not always able to choose what is best for them in the long-term. Many parents think in terms of their needs and do not understand the needs children will have to prepare themselves for the society they will be part of. (PC)

They may have to await Court decisions of this matter. But my visceral feeling is that the freedom of the parent has relevancy within the context of the Canadian Charter of Rights and Freedoms. (SC)

3. *Private schools do represent a useful function in providing for specific needs expressed by individuals and groups.*

All separate school superintendents and private school principals agreed with the statement. The lowest proportion of agreement (65%) was found for public school superintendents. The comments (15) of public school superintendents and board chairmen suggested that sufficient provision for all needs can be provided by the public schools. Superintendents, public and separate, also commented (9) on the possible danger of excessive parochialism on the part of private schools.

Though only three percent of the Gallup Poll respondents had children in private schools, 72% of all respondents indicated that they would recommend the private school as an alternative.

Selected comments

All parents favoring private schools should remain mindful of the rest of society and the different backgrounds of others—the danger with private schools is that they could get very narrow in scope. (SS)

They meet the specific needs of the group that cannot get satisfaction within the public system. (PC)

So long as public/separate boards respond slowly or do not respond at all to special groups, then private schools will continue to flourish. (SC)

Although the public system is doing a good job for the majority of students it is beneficial to maintain private schools to allow alternatives for parents and/or students who are seeking a type of education or an orientation in education which they feel is not found in the public system. (PP)

4. *Since private school supporters, like public school supporters, through taxation support public education, this has a bearing on whether or not public grants might be allocated to private schools.*

Only 40% of public school superintendents, in contrast to 69% of separate school superintendents, were in agreement with this statement. A closer examination revealed that rural superintendents tended to be less in agreement with the statement than were urban superintendents, and public school chairmen less than separate school chairmen. With the exception of public school superintendents, the other respondent groups volunteered comments (25) to the effect that since private school supporters paid public school taxes, they deserved some entitlement.

According to the Gallup Poll (1984), 77% of the respondents agreed that parents ought to be able to direct tax dollars to the school of their choice, and 57% favored provincial funding of private schools. Woods Gordon (1984) found general disagreement among public school groups towards the proposition of parental right to direct taxes to a school of their choice, and opposition to support of private schools through the regular means of taxation available to public schools. Woods Gordon also found that the majority of public school respondents thought current public funding of private schools to be adequate. However, in his recommendations to the Minister, Woods Gordon favored some additional support for private schools, and said that according to an appropriate formula, private schools which meet provincial standards be accorded the same types of provincial grants (with the exception of capital grants for facilities) which are available to public schools.

Selected comments

Everyone benefits from the general education of a community like they do from roads and so should pay to provide them. If a person wants a private road or private education for his child that is a totally separate matter. (PS)

I have no objection to parents' educational tax dollar following the child to his/her private school. (SS)

I am somewhat of a believer that the "dollars" of support should follow the child. (PC)

Parents of students in private schools are also part of the public and so their children should qualify for public grants. Also, private schools do perform a public good by educating children. (PP)

5. *The existence of a constitutionally-based choice for Catholics is an argument for providing a similar, even though limited, choice to other denominations which would be different from that of being locked into a secular or nonsectarian school system.*

Most private school principals (89.5%) were in agreement, whereas a minority of public school superintendents (35.0%) agreed. It is understandable that a greater proportion of Catholic separate school superintendents (76.9%) would be inclined to agree. A closer examination indicates that a greater proportion of separate board chairmen than public chairmen tended to agree with the statement. A number of statements (23) suggested that other groups should be accorded privileges similar to those enjoyed by Catholics. Other statements (10), most of which were proffered by public school superintendents, warned that some practical limits must be set in order to prevent extreme fragmentation of the school system.

Selected comments

It is my belief that the formation of a Catholic school system has not contributed in a positive way to the advancement of education or democratic principles. To create further fragmentation would compound the problem. (PS)

I am a superintendent of an R.C. Separate District. The arguments I use to justify separate schools are identical to those used by denominational private schools. (SS)

History does not so favor other religious groups in Alberta. But Catholics are a minority, thus I often ask why should one minority be so favored? (SC)

If we accept that Canada is a multicultural nation, then we must also accept that it is a multireligious nation. If we accept that human rights are a fact, then we *cannot* afford to overlook the above in providing these in our Charter and school systems. (PP)

6. *Any perceived "flight to private schools" is cause for a more critical assessment of current public education.*

There was overwhelming agreement with the above statement. The lowest proportion (75%) was found among public school superintendents. Among the latter, the rural superintendents tended to be more in agreement with the statement than the urban. Most statements (25) suggested the need for a study of inherent problems and an evaluation of public schools.

The Gallup Poll found that 74% of respondents would want religion in schools either as a core subject (12%) or as an option (62%). Eighty percent would want moral or ethics education as a core subject (30%) or as an option (50%). The Canadian Education Poll (August, 1984) related that 18% of polled Canadians reported little confidence in their public school, and that 48% said that they had "too little say" in how schools are run. The Minister's Advisory Committee (January 1985) recommended that schools develop policies "which reflect the value of high standards of interpersonal conduct," and "that foster the development of moral and ethical standards" (p. 7).

Selected comments

We cannot be blind to the inequalities and inadequacies of some of our schools. . . . Evaluation of systems, teachers, students must be ongoing. (PC)

Trustees should take up the mantle and assess what is happening in their own jurisdictions. (SC)

7. *More general control and evaluation of private schools should be exercised by the provincial Department of Education.*

Only 42.1% of private school principals agreed with this statement which received overwhelming support from respondents in each of the other categories. About 41 volunteered comments suggesting that private schools should undergo about the same degree of control as public schools. Half the comments of private school principals claimed that the amount of current control is adequate.

The Gallup Poll found that 66% of the respondents thought that private schools need to be authorized by the government; 90% that their teachers meet provincial standards for certification; 85% that their buildings, and 84% that their curriculum meet provincial standards.

Most respondents in the Woods Gordon (1984) study thought that current regulations, monitoring and evaluation procedures to be adequate. The Province currently possesses all necessary legal powers to regulate and monitor private schools. Any restrictions would be such as might arise from an interpretation of the Canadian Charter of Rights and Freedoms and the Alberta Bill of Rights. Such testing of the performance of students in private schools as compared to students in public schools, which was done at the behest of Woods Gordon in its Minister-mandated study, did not produce results which allow clear and indisputable conclusions or cause for alarm. A major concern was expressed in relation to insufficient Canadian content of curriculum materials imported from the USA.

Selected comments

Although parents may choose the private school route, their children are entitled to the best quality possible. Alberta Education has the responsibility of monitoring all educational institutions to ensure that children are not shortchanged. (SS)

The Department of Education should be able to satisfy itself that a private school is providing a good quality education for its students. (PP)

8. *A public school board should be given advance notice and an opportunity to plan program adjustments before a private school is permitted to open its attendance area.*

Superintendents and board chairmen were in substantial agreement, and about half (47.4%) of the principals also agreed that such notice ought to be given. About 38 comments reinforced the position that school districts need advance notice in order to adjust plans when they face the probability of a decreased enrolment.

Selected comments

Yes, primarily to explore more fully the avenues of making the role of "public" school better understood and also to plan reasonable adjustments. (PS)

School boards should also be given the opportunity of responding to the special educational needs and providing the special services which will be met by the private school. It may be that a board has not been aware of the specific needs of its constituents. (SS)

If this were to happen, with concerned parents honestly discussing their concerns, there could be fewer private schools. (PC)

I believe it would be good P.R. for private schools, before they get established, to give advance notice to the public school board about establishing a school. . . . We established our school for religious reasons (faith commitment), not necessarily because we felt the public schools were doing a "bad job." (PP)

9. *A public school board should receive undiminished provincial grants during a period of adjustment when an enrolment decline is due to the opening of a private school.*

Unlike private schools, public school systems have a provincially mandated obligation to provide for every resident student. When public schools lose students, they also lose the per student provincial grant subsidy. Particularly during times of general enrolment decline, the loss of students adds to the burden of meeting school costs. Only 15.8% of private school principals responded at all to this item, and these were in agreement with the other respondent groups. About 35 comments emphasized the need of undiminished financial support during a period of adjustment.

10. *The incorporation of "private schools" as "alternate schools" under committees responsible to a public board is a desirable course of action.*

Only 21.2% of the private school principals favored this alternative. Neither did the alternative receive overwhelming support from any of the other groups. Respondents from all groups offered comments (22) stating that such accommodation ought to be possible. About as many (21) warned that such an arrangement would be undesirable for both parties. Separate school chairmen tended to agree with the statement in greater proportion than did public school chairmen.

Selected comments

I think that this should be the first step prior to starting a private school. If the public system does not or cannot meet the needs of a particular group then it should be allowed to plan the operation of a private school. (PC)

The experience of some schools which have elected this route in the past appears to be far less than desirable. Operating directly under the jurisdiction of the Department as a private school is generally preferable. (PP)

11. *Private schools which receive public grants ought to be obligated to observe open admission policies similar to those of public schools.*

Though this position met with unanimous support on the part of public school superintendents, only 61.5% of the separate school superintendents favored the prospect. The latter are cognizant of some controls they can exercise with respect to which sector of the local populations shall have unrestricted access to their schools. It is interesting to note that a proportion as large as 42.1% of private school principals supported the open admission position. Comments included: that funding should be related to the nature of an open admission policy (11); that the adherence of admitted students to school policy is essential; and that an open admission policy might defeat, in part, the purpose of private schooling (5).

Selected comments

All the children who meet the basic criteria which set the private school apart from the public school should be admitted. (SS)

If the philosophy, goals, and objectives meet the parents' needs and if the public grants are at par with the public schools, then an open admissions policy ought to be in effect. (PP)

12. *The option of operating a private school without certificated teachers when no public subsidy is being received should continue.*

For each group, support was registered by only a minority of respondents. Urban more than rural superintendents, and separate more than public board chairmen were inclined to agree with the option. Eighteen respondents indicated in their comments that with adequate supervision and evaluation such accommodation should be possible, yet 23 others insisted that certification of teachers should be a requirement for private as well as for public schools.

Selected comments

The option of operating schools without certificated teachers when no public subsidy is being received should be allowed to continue. (SS)

I think it best that all teachers be certificated. . . . Their values or secular viewpoints may have to pass the scrutiny of a private school board. (PC)

The option of operating a private school without certified teachers should continue, as long as it can be verified and demonstrated that the educational standards are at par with public schools. (PP)

13. *Public school teachers are as committed to their schools as are the teachers of private schools to their schools.*

Only 26.3% of private school principals agreed with the statement. However, the other three respondent groups did not show an overwhelming conviction regarding the commitment of their teachers in relation to private school teachers. Most comments (18) indicated the belief that the commitment of teachers was about the same in private and public schools. Another ten felt that private school teachers need to be more committed as they enjoy less security of tenure and may be teaching for lower salary than public school teachers. Others (7) felt that commitment was a characteristic of the individual teacher, whether the teacher be in one type of school or in another.

Selected comments

Teacher commitment as a norm cannot be associated with one more than with the other. It is a matter of an individual's professionalism. (SS)

Most public school teachers are committed to their schools but I think all teachers of private schools are committed and extremely dedicated to their school. (PC)

Some public school teachers are very committed to their schools. The difference is that the public school system appears to be stuck with the uncommitted as well as the committed. (PP)

14. *Parents of children in public schools are as committed to their schools as are parents of children in private schools to their schools.*

Private school principals tended to be less in agreement with this statement than respondents from other groups. However, only 50% of board chairmen, and less than half of the public school superintendents (30.0%) and of the separate school superintendents (46.2%), felt confident in claiming the same commitment for parents of children in their schools. Comments included that there was little difference (20); that the additional costs and involvement accounted for greater parental commitment for private schools (23); and, that parents take public schools for granted (5).

Selected comments

Private school parents may have to devote more of their resources towards their schools, but this should not be confused with commitment to their children's education. (PS)

Very probably—and with one difference! When a parent has *made a choice* and is *paying fees*, he/she is more likely to be involved in the school. If you are paying for something *directly* then you are going to make sure that it works. (PP)

15. *Students of public schools are as committed to their schools as are students of private schools to their schools.*

Only 61.5% of separate school superintendents and 50.0% of public school superintendents and board chairmen agreed with the statement, and only 21.1% of private school principals thought such to be the case. Many respondents, representing respondents from each group, felt that there was little difference in commitment on the part of students in public or private schools, but that any differences were those attributable to the individual student and the student's home (25). Others (10) felt that private school students might be more committed as a result of a selection process available to private schools.

Selected comments

I suspect that students whose parents have to pay tuition fees are pressured by parents to be more committed to achieve than perhaps some students in the public school system. However this depends upon the parents. (PS)

Students in private schools are more committed probably because they or their parents have chosen a school with which they can strongly identify. (PP)

Summary and Discussion

The findings arising from the responses to the first questionnaire to public school superintendents allow the following generalizations:

1. Private school growth was not restricted geographically, but has occurred generally in all parts of the province;
2. There has been an uneven loss of students to private schools among jurisdictions—the smaller districts suffered the impact of loss in enrolment more than did larger urban districts;
3. A considerable growth of small unauthorized private schools had occurred by 1984 (only two or three of these had neglected to obtain ministerial authorization by the summer of 1985);
4. Only a few school systems under the school boards had established formal or informal relationships with private schools located within their district boundaries;

5. About half of the superintendent respondents anticipated further private school developments within their jurisdictions;
6. Very few school districts operated alternative schools for special resident interest groups, though about half of the respondents indicated that they considered such arrangements preferable to the establishment of private schools.

The high rate of return from superintendents may indicate a considerable level of interest, and perhaps also of concern, regarding private school growth. Private schools are located in about two-thirds of the jurisdictions under public school superintendents. Some of the schools enroll only a few pupils, some have become large institutions enrolling several hundred.

Table 4 contains a compilation of responses to the second questionnaire. Table 5 provides arbitrary numerical weights applied to ranges in percent of respondents who agreed with each of the statements, where +3 indicates 85% or more of the respondents of a group agreeing, and -3 less than 15% agreeing (or 85% or more disagreeing) with a statement. A weight of 0 has been given to a range of 45 to 54% of respondents of a group agreeing with a statement, that is, where about half of the respondents of a group agreed and about half disagreed with a statement.

Wherever a respondent group differed substantially from the other three groups, such is indicated by an asterisk. Thus it can be seen that for about half of the statements, the private school principals differed substantially from the other groups; public school superintendents in questioning the useful function of private schools; and the board chairmen in questioning the historical relevance of private schools.

General agreement was found among respondent groups with respect to the relevance which the following factors have to issues relating to private schools:

1. the historical context (statement #1);
2. the freedom of choice (separate school superintendents more so than did the public) (#2);
3. the needs of individuals and minority groups (separate school more so than public school superintendents) (#3);
4. the state of public education (#6);
5. the degree of provincial responsibility and control (#7);
6. the impact of the establishment of private schools upon district school programs (#8 & #9); and,
7. the requirement of certification for all teachers (#12).

Less certainty of opinion between groups was expressed with respect to the following:

1. the justification of public funding for private schools (#4);
2. the relevance of the constitutional provision for Catholic separate schools to the preference of other denominations in schooling (#5);
3. the incorporation of private schools as alternative schools under district boards (#10);
4. an open admission requirement for private schools (#11);
5. the requirement of uniform certification for all teachers to include those in private schools (#12); and,

Table 5
Weighted Opinion of Respondent Groups

Statement	Group PS	SS	C	PP	Consensus
1. Historical relevance	3	3	1*	3	strong
2. Freedom of choice criterion	2	3	3	3	strong
3. Useful function of private schools	1*	3	2	3	general
4. Grants to private schools justified	−1	1	0	3*	low
5. Constitutional precedence of R.C. Separate	−1	2	1	3	low
6. Need to assess public schools	2	3	3	3	strong
7. Need more provincial control of private schools	3	3	3	−1*	general
8. District boards require advance notice	3	3	3	0*	general
9. Boards require undiminished grants to cover loss of pupil grants	3	2	2	−2*	general
10. Private schools as alternative under boards	1	1	1	−2*	general
11. Open admission policy	3	1	3	−1*	low
12. Uncertificated teachers in private schools	−1	0	−3	−1	general
13. Commitment of public teachers vs. private	1	0	1	−2*	general
14. Commitment of public parents vs. private	−1	0	0	−2	general
15. Commitment of public students vs. private	0	1	0	−2	general

Groups:
PS-public sch. supts.
SS-separate sch. supts.
C-board chairmen
PP-private sch. principals

*Respondent group differs substantially from other three groups

Numerical scale	Range in % of respondents in agreement with statement
3	85-100
2	70-84
1	55-69
0	45-54
−1	30-44
−2	15-29
−3	0-14

6. the commitment and involvement of teachers, parents and students in public as compared to private schools (#13, #14, & #15). (Private school principals claimed the commitment to be somewhat higher for private than for public schools. Public school superintendents tended to agree with private school principals that their parents were not as committed as those for private schools.)

Obviously, smaller districts are more sensitive to the loss of grant revenues and curtailment of programs upon losing students to private schools than are the districts with larger student populations. Quite understandably, public school districts would like to be able to plan necessary changes prior to the loss of students to a private school, and therefore would like to receive adequate notice. At least some districts would want the opportunity of meeting with parents wishing to establish a private school in order to ascertain whether their particular needs could be met within the existing schools. Some districts would want to try to meet the needs of

minority groups through alternative programs within the schools, and a few would consider operating alternative schools in preference to seeing the establishment of private schools. However, many superintendents regretted that removal of students from the public schools was deemed to be necessary by some parents. Some acknowledged that an assessment of their school programs and activities is warranted when some residents give strong reasons for removing their children in order to enroll them in a private school of their choice.

The Gallup Poll on Alberta Education indicated a generally liberal acceptance of alternatives in education such as that provided by private schools. The recommendations of the Woods Gordon (1984) consultants were supportive of such alternatives. In this study, respondents representing Catholic separate schools, cognizant of a right enjoyed by one denominational group, were inclined to express a more liberal view towards the support of private schools. Furthermore, there was fairly strong consensus on the part of all respondent groups that the freedom of choice criterion has relevancy in both public and private education.

Major issues, rather, concern more the quality of education offered to children than the question of whether public funding ought to be directed to private schooling. These issues were also raised at a conference on education finance in Alberta by Atherton (1985) in the consideration of concepts of equity. Whereas private schools serve the needs of a selective clientele, the needs of the disadvantaged minorities may need to be met largely by the public schools. However, in fairness it must be said that the needs of some of the severely handicapped were being served (and some still are) by private schools established for that purpose before an enlightened public conscience included their needs within the public domain.

Conclusion

During 1985 about 97% of all Alberta elementary and secondary pupils were enrolled in schools under elected district boards. That suggests that any impact of the growth of private school enrollment would be felt at the local district rather than at the provincial level. It would seem, then, that the impact which public funding of private schools has on public schools ought to be of concern to provincial education authorities who might be able to provide measures of support towards the alleviation of any disadvantages suffered by public school systems. The question, whether or not the establishment and operation of private schools is to be supported through public funding, is a matter of government education policy in part wrought through the political pressure of the private schools sector electorate. A governmental disposition to grant such support is not unrelated to prevailing societal and political values. For example, though a bitter public debate raged in Manitoba following the MacFarlane Commission's 1959 recommendations regarding an introduction of public funding for private schools, a modest measure of such funding was introduced without much controversy about 20 years later. However, by that time the other three western provinces and Quebec had introduced varying programs of public funding of private schools. Currently the controversy is centered in Ontario, where the Shapiro Commission has made recommendations which, if implemented, would alter considerably the status of private education in that province.

As in the other provinces, since the beginning of this century, public education has enjoyed phenomenal growth and its services have become available to every child in Alberta. Perhaps in this decade decisions are being initiated which may

substantially alter the future provincial landscape in education. Private schools, at one time practically ignored or merely tolerated, have gained a political and educational prominence out of all proportion to the number of students they serve. It appears that for the first time in the education history of some provinces, including Alberta, public school systems as the sole providers of educational services to all clients is being put in question, and that a societal climate is emerging in which the partial privatization of educational services could become a reality. The concern of committed public educators must be whether, in the long run, the consequences of such an eventuality may yield a net loss to education.

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Eliciting the Language Function of Forecasting/Reasoning in Elementary School Classrooms

The purpose of this study was to explore possible methods which might be used within the elementary school classroom to elicit the language function of Forecasting/Reasoning, and to examine the performance of children of various ages in their use of language for this function. Kindergarten, grade three, and grade six students engaged in a problem-solving activity under one of three treatment conditions: the activity alone, the activity including a language model, and the activity including the researcher's use of a questioning strategy. Results indicated a significant difference between grade three and grade six at the .01 level of significance. Grade three students used significantly more language for Forecasting/Reasoning. Results also indicated that the questioning strategy was significantly more successful than either the activity alone or the language model in eliciting Forecasting/Reasoning. No significant interaction effect was found between grade level and treatment.

Success in learning within the school environment is closely linked to skill in oral language (King, 1984; Shafer, Staab, & Smith, 1983). Those children who talk easily, make their questions clear, and get their meanings across to the teacher receive more attention and can influence more successfully the flow of instruction to meet their needs (King, 1984). Central to the issue of talk and getting one's meaning across is the concept of language function (i.e., the purpose for which one uses language). Adequate command of oral language includes the ability to use language for a variety of functions such as to inform, to request, or to reason within appropriate contexts. Verbal interaction in classrooms requires functional competence (Wilkinson, 1985). The purpose of this study was to explore possible methods which might be used within the elementary school classroom to elicit one specific language function, that of Forecasting/Reasoning, and to examine the performance of children of various ages in the use of language for this function.

Halliday (1973) has proposed the concept of language function as the seminal idea for language development, as evidenced in the following statement: "The

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child's awareness of language cannot be isolated from his awareness of language function, and this conceptual unity offers a useful vantage point from which language may be seen in a perspective that is educationally relevant" (p. 20). Halliday has advanced the notion that language function is central to a child's language development and that the development of syntax and vocabulary, about which educators appear to be so highly concerned, springs from a functional base. Children understand what language is because they understand what language does (Yalden, 198l; Loban, 1979; Halliday, 1975).

Coupled with the notion that children understand language because they understand its function, is the recent finding indicating that children need to use language for a variety of functions within the school setting (Pellegrini, 1984; Chapman, 1981; Hunter-Grudin, 1979; Halliday, 1978; Tough, 1973). Children's command of a large repertoire of functional uses of language is directly related to their ability to communicate effectively in a number of different contexts and with many different kinds of people (Pellegrini, 1984).

If children need to use language for a variety of functions within the school setting then it seems necessary to list and describe these language functions. Tough (1979, 1973) has listed seven specific language functions which her research indicated are necessary for school success. Tough's seven language functions are:

1. Self-Maintaining (i.e., justifying and supporting the self, as in expressing needs and justifying behavior—"It's my turn.")
2. Directing (i.e., requesting or demanding something—"Please hand me a pencil.")
3. Reporting (i.e., giving information—"That shape is square.")
4. Towards Logical Reasoning (i.e., drawing conclusions and stating cause and effect relationships—"The bridge collapsed because the log was too short.")
5. Predicting (i.e., speculating about the future—"It's going to rain tomorrow.")
6. Projecting (i.e., projecting into the feelings of others—"She is feeling unhappy.")
7. Imagining (i.e., any of the above said in a pretend context or when fanatasizing out of a real-life situation—"I'm a queen.")

Even though these language functions have been deemed necessary for school success there has been little suggestion in the literature as to how children might be encouraged to use language for these functions or little exploration into specific factors of the classroom situation which tend to elicit these functions. As language, including language functions, is always context specific (Garvey, 1984; Shuy, 1984; Wells, 1981), one answer lies in developing contexts within the classroom for which particular functions of language are appropriate.

In a previous study, the researcher developed several appropriate contexts by designing a series of activities which were designed to elicit each of Tough's (1979, 1973) seven functions of language (e.g., a specific activity to elicit Self-Maintaining, a specific activity to elicit Directing, etc.). Results of this study matching activity with function indicated that it was possible to design an activity which elicited a significant amount of language used for a specific language function (Staab, 1983).

Central to each activity designed to elicit a language function was what was termed the essence of that activity (Staab, 1983). The essence of an activity was that key factor within the activity which was actually related to the elicitation of the desired language function and which could generalize to other similar activities

(i.e., those activities eliciting the same language function). For example, the essence of the activity designed to elicit the language function of Towards Logical Reasoning was solving a problem, yet the actual activity might be a science experiment to determine which of a number of objects would float. Shafer, Staab, and Smith (1983) conducted a two-year field study in a metropolitan area of the southwestern United States and determined that various activities which included the same essence did elicit similar language functions. By using the essence, countless activities of varying degrees of difficulty could be designed to elicit the same language function.

Previous studies further indicated the following results which are germane to the present study. The language functions of Self-Maintaining, Directing, and Reporting occurred to a reasonable degree over all activities, while the language functions of Towards Logical Reasoning, Predicting, Projecting, and Imagining were highly concentrated in only one or two activities and virtually absent in others (Staab, 1983). This finding concurred with the findings of Pinnell (1975) who analyzed the language used by grade one pupils throughout the school day regardless of activity. It was determined also that the activity designed to elicit Towards Logical Reasoning and the activity designed to elicit Predicting tended to elicit both language functions within the same activity (Staab, 1983). It was concluded that it is often necessary to make predictions before one actually attempts to solve a problem (ibid.), thus Tough's (1979, 1973) language functions of Towards Logical Reasoning and Predicting were collapsed into one category, labeled Forecasting/Reasoning. Tough's original category system was further modified and some functions were renamed as a result of research (Staab, 1983; Shafer, Staab, & Smith, 1983). The resulting category system with language examples appears in Table 1. Self-Maintaining was modified and renamed Asserting and Maintaining Social Needs; Directing was modified and renamed Controlling; and Reporting was modified and renamed Informing. The category of Imagining was deleted because it included any of the other language functions which were used in a make-believe context and that distinction was not necessary in the present study. The category system in Table 1 was used in the present study.

The general focus of the present study was to concentrate on the language function of Forecasting/Reasoning. Any utterance which could be categorized as one of the eight subfunctions appearing under the heading of Forecasting/Reasoning in Table 1 was termed a Forecasting/Reasoning statement. The unit of analysis and specific classification criteria are explained in the Methods section. Forecasting/Reasoning was chosen as a focus because this function is emphasized within the elementary school curriculum and because the elicitation of this function requires highly specific contexts (Staab, 1983; Pinnell, 1975). Forecasting/Reasoning was examined within the elementary school setting and three specific objectives were included. These objectives were as follows:

Developmental Differences

Previous studies were conducted using kindergarten and grade one children as subjects (Staab, 1983; Pinnell, 1975). It was found that in an activity specifically designed to elicit Reasoning, kindergarten children used 9.25% of the total language elicited for the desired function (Staab, 1983). Although significantly more language for the function of Reasoning was used in this activity than in any of the other activities, the percentage is low when compared with the proportion of language used for the other functions listed in Table 1 within their designed activities

Table 1
Five Functions of Language with Subfunctions and Examples

Function 1: Asserting and Maintaining Social Needs

Subfunction	Examples
1. Asserting personal rights and/or needs:	a. I want some juice. b. Give it to me, it's mine. c. I'm first 'cuz I'm the oldest. d. I hit him because he hit me first. e. I need a blue crayon.
2. Asserting negative expressions: criticizing, arguing, threatening, and giving negative opinions:	a. You're talking too much. b. I told you to quit it. c. Stop it or I'll tell. d. That looks dumb.
3. Asserting positive expressions:	a. Yes, I think so too. b. I like your building. c. It tastes good to me.
4. Requesting an opinion:	a. Do you like this?
5. Incidental expressions:	a. Oh, gee. b. Good grief.

Function 2: Controlling

Subfunction	Examples
1. Controlling actions of self and others:	a. Turn it around (to self). b. Get one egg. c. Give me the blue one. d. Put your name at the top and I'll give it to the teacher.
2. Requesting directions:	a. How do you do this? b. Where shall I put this?
3. Requesting another's attention:	a. Watch this. b. Look here.

Function 3: Informing

Subfunction	Examples
1. Commenting on past or present events: labeling, noting details, noting specific incidents, and/or noting sequence (includes statements made in both first and third person:	a. That's a car. b. It's blue and white. c. I (the boy) have (has) some paint. d. I put the red on before the yellow.
2. Comparing:	a. The first bus is longer than the second.
3. Making generalizations based on specific events and details:	a. My brother is sick today. b. The cars were in an accident.
4. Requesting information:	a. What color is this? b. Is this one longer?

Function 4: Forecasting and Reasoning

Subfunction	Examples
1. Explaining a process:	a. When you break your arm they put something on it like a bandage and plaster.
2. Recognizing causal and dependent relationships:	a. If the bridge is low, boats can't go under and it'll have to open in the middle to let them out.
3. Recognizing problems and their solutions:	a. This box isn't big enough to make a garage to so I'm going to make it with blocks.
4. Justifying judgments and actions:	a. I'm cutting this box to make doors 'cos we use doors to put cars in.
5. Drawing conclusions:	a. I don't think we better take the clock to pieces because we'd never get it together again.
6. Recognizing principles:	a. I want a bike, but I can't have one because it's too dangerous.
7. Requesting a reason:	a. Why does this work?
8. Anticipating/forecasting (in terms of anticipating problems, possible solutions, alternative courses of action when problem is spotted, and predicting consequences):	a. That brick won't be long enough, I'll get some wood. b. We could make a bridge or we could get a long ladder. c. That propellor will fall off, if you put it on that way.

Function 5: Projecting

Subfunction	Examples
1. Projecting into the feelings and reactions of others:	a. He's feeling sad. b. He's probably mad about it.
2. Projecting into the experiences of others:	a. I wouldn't like to live in the zoo like tigers. b. That boy's parents are fighting and he is caught in the middle.

(ibid.). Given the Piagetian notion (Piaget & Inhelder, 1969; Piaget, 1926) of a child's cognitive development, one must speculate as to whether or not the liberal use of language for Reasoning is a matter of cognitive development. The present study explored the language of children at roughly the ages Piaget would term Preoperational, Concrete Operational, and at the level of Formal Operations in an effort to determine differences in the use of language for Forecasting/Reasoning.

Influence of Modeling

The influence of modeling was determined by including a language model in a small group activity. Within the context of the present study, a language model was defined as a person using language liberally for the function of Forecasting/Reasoning. Wells and Wells (1984) have stated that children learn most effectively when there is an opportunity for collaborative talk with the teacher and peers, and Cazden (1983) has noted that language models are valuable in helping children learn particular discourse forms needed within the school setting. This study attempted a more scientific investigation of these theories. Specific information on the language modeling technique is presented in the Methods section.

Influence of a Questioning Strategy

Athey (1983) has proposed that some discussion time in classrooms might be spent more productively with the teacher deliberately posing problems to help students sharpen their concepts. The present study explored the possibility that a questioning strategy designed to elicit Forecasting/Reasoning would increase students' performance in the use of this language function within an appropriate activity (i.e., an activity specifically designed to elicit Forecasting/Reasoning). The questioning strategy is discussed in the Methods section.

A desired exploration of age differences in the use of Forecasting/Reasoning, and the effects of modeling and of a questioning strategy led to the formation of three specific hypotheses.

Specific Hypotheses

Children in kindergarten, grade three, and grade six worked in groups of three with others of comparable ages on activities appropriate to their grade level and specifically designed to elicit Forecasting/Reasoning (i.e., the activities contained the essence of problem solving). During one treatment, hereafter termed "Activity," the three children engaged in a problem-solving activity by themselves. During a

second treatment, hereafter termed "Modeling," the researcher joined the group of three children as a language model within the course of the activity. During the third treatment, hereafter termed "Questioning," the researcher joined the three children during the activity and engaged in a specific questioning strategy. These treatments are explained in detail in the Methods section. All activities were videotaped and a written transcript made from the tape. The resulting language was segmented into separate utterances and categorized using the system described in Table 1. The study tested the following hypotheses:

1. The amount of language used for Forecasting/Reasoning will differ over grade level averaged over all treatments.
2. The amount of language used for Forecasting/Reasoning will differ over treatments averaged over all grade levels.
3. The amount of language used for Forecasting/Reasoning will differ across grade level across treatment.

Method

Subjects

Subjects were 90 kindergartners, 90 students from grade three, and 90 students from grade six. The subjects were from three elementary schools located within a suburban area of Vancouver, British Columbia. The three schools were chosen by the superintendent of the school district because of their similarity in socioeconomic factors, each school drawing students primarily from suburban, middle class neighborhoods. Thirty students from each grade level were taken from each school.

Classroom teachers were asked to choose subjects on the basis of three criteria: (a) the subject was fluent in English, (b) he/she seemed to be an adequate user of language in many situations, and (c) he/she appeared to use language occasionally for Forecasting/Reasoning. Karlin (1980) has stated that teachers' opinions of students' abilities are as accurate as are the results of standardized tests and perhaps more accurate. The data were collected near the end of the school year so it was assumed that teachers were able to choose subjects according to the criteria.

Design

The subjects within each school, and within each grade level (i.e., kindergarten, three, and six) were assigned randomly to groups of three, hereafter termed triads. Although randomly assigned, students were not separated from members of either their own grade or their own class. As there were 30 subjects per grade level per school, 10 triads per grade level per school were formed. Each of these 10 triads was then assigned randomly to one of three treatments: (a) Activity, (b) Modeling, or (c) Questioning. These treatments are discussed further in the Procedure section. As there were three treatments and 10 triads, the final triad at School One at each grade level was assigned randomly to one of the three treatments. The final triad at School Two at each grade level was then assigned randomly to one of the two remaining treatments, and the final triad at School Three was assigned to the remaining treatment. Because subjects were recruited from schools with similar populations, the researcher believed that "School" might be eliminated as a variable, however this notion was subject to investigation.

The original research design was a 3 x 3 fully-crossed MANCOVA (grade level x treatment). Following each of the treatments the triad engaged in an art activity

during which the language used for Forecasting/Reasoning was designed to serve as a potential covariate.

Procedure

Ten triads per grade level per school engaged in one of three treatments: (a) Activity, (b) Modeling, or (c) Questioning. All treatments were videotaped and took place in a small conference room at the subjects' respective schools. Prior to each treatment session, the researcher met with each triad in an effort to establish rapport and demonstrate the video equipment. The treatment sessions were videotaped by a trained research assistant, as the researcher was a participant in both Modeling and Questioning. Each triad engaged in one treatment only once and all treatments were completed within a single school before the researcher and the research assistant moved to another school.

Subsequent to the videotaping, a written transcript was made by a second research assistant and checked for accuracy by the researcher.

Treatments

Treatment 1: Activity was an activity specifically designed and tested to elicit the language function of Forecasting/Reasoning (Shafer, Staab, & Smith, 1983). The essence of the activity was solving a particular problem which had been posed by the researcher. As previously mentioned, the essence of an activity is that specific element which elicits the language function and which can be generalized to other similar activities. The problem was presented verbally to the triad and all the needed materials to discover its solution were made available. The subjects were then allowed to work on the problem without any further interaction with the researcher. The activity was concluded when the subjects indicated by words or actions that they had finished. Three different activities were used, one for each grade level. As the essence of all activities was solving a specific problem, it was unlikely that what would present a problem to kindergartners would also present a problem to subjects in grade six. The fact that the three activities were "equal" in their ability to elicit Forecasting/Reasoning has been previously discussed. The specific activity used at the kindergarten level was a float/sink experiment. Kindergarten triads were given a number of objects and asked to determine which would float in a small tub of water. If certain objects did not float, the kindergartners were asked to devise ways to make them float. Blocks of wood and bottles with caps were provided for that purpose. The activity at the grade three level was to determine which objects would conduct an electrical current. A circuit using a battery and a small light bulb was devised. Students were given a number of objects which would conduct electricity and a number which would not conduct electricity. The grade six subjects were provided with a model of a city on which were placed movable cardboard houses, schools, parks, building, an airport, and so forth. Subjects were to decide how the city might be designed in terms of efficiency, convenience, and transportation patterns, and then to place the movable parts accordingly.

The following is a sample from a sixth grade transcript. G, T, and B are subjects.

G. Move the city hall to the right because it should be closer to downtown.

T. No, it's good there.

B. I don't like all the parks together.

Treatment 2: Modeling was the same activity per grade level as used in Treatment 1: Activity (i.e., kingergarten/float-sink, grade three/electrical circuit, and grade six/model town). However, during Modeling, the researcher joined the triad as a fourth participant. The researcher made one utterance which could be classified as Forecasting/Reasoning every 30 seconds. Sample Forecasting/Reasoning statements appear in the example section of Table 1 under the heading Forecasting/Reasoning. These utterances fit the context of the conversation and were germane to what was happening at the specific time.

The following is a sample from a sixth grade transcript. R is the researcher and M and N are subjects.

R. I don't think we should put the airport downtown because land is too expensive.

M. How about in the right-hand corner?

N. No, over by the dump.

Treatment 3: Questioning was the same activity per grade level as Treatment 1: Activity (i.e., kindergarten/float-sink, grade three/electrical circuit, and grade six/model town). During Questioning, however, the researcher joined the triad as a fourth participant and asked a question designed to elicit Forecasting/Reasoning every 30 seconds. Sample questions are contained in Table 2.

Table 2
Questioning Strategy to Elicit Forecasting and/or Reasoning

Strategies	Examples
1. Questions to elicit explaining a process:	a. What happens when you break your arm?
a. Questions to elicit recognizing causal and dependent relationships:	b. If the bridge is too low, what will happen to boats?
b. Questions to elicit recognizing problems and their solutions:	c. What's the matter here? What can we do about it?
c. Questions to elicit justifying judgments and actions:	d. Why are you doing that?
d. Questions to elicit drawing conclusions:	e. Why do you suppose this is happening?
e. Questions to elicit recognizing principles:	f. What is the general reason why all these work?
f. Questions to elicit a reason.	g. Why do you think so?
g. Questions to elicit anticipating/forecasting:	h. What will happen if . . . What could we do now?

The following is a sample from a sixth grade transcript. R is the researcher and P and H are subjects.

R. Why should the housing development be close to a park?

P. Because kids need a place to play.

H. Yeah!

Following each treatment, each triad at all grade levels engaged in an art activity without the researcher involved. Each triad was given one large sheet of paper and felt tip pens and then asked to cooperatively draw a group picture. The art activity was also videotaped, a written transcript made, and the resulting language coded according to the functions listed in Table 1. The number of utterances used for the function of Forecasting/Reasoning was used as a potential covariate. As the amount of language used for the function of Forecasting/Reasoning is not prevalent over all school activities (Staab, 1983; Pinnell, 1975), an art activity which entailed some amount of planning was devised and it was believed that this art activity would elicit some language used for Forecasting/Reasoning.

Unit of Analysis

The written transcript from the videotape was divided into statements which were used as the unit of analysis. Statements were defined a short segments of talk and identified as according to the following criteria: (a) a statement is composed of a word, a series of words, or a sentence; (b) a statement must contain a clear thought or idea; (c) a statement need not be "grammatical" in the formal sense; and (d) immediate repetition of a word or words which express the same idea are not counted as separate statements. In the following transcript, used for illustration, statements are marked with a slash (/).

Context: (The children were testing objects in a pan of water to determine whether or not the objects would float.)

S. Oh that won't float/(looks at the object before testing)

J. Un, un/(shaking his head indicating "no")

T. Let's see if this will float/(holds up object). It does, it does/

S. If you want to make this float, you're going to have to strap it to some wood/(holds up nail).

Language Categories

Each statement was categorized according to the category system which appears in Table 1. The total number of statements per function per triad was calculated. Statements were categorized according to the full range of language functions (i.e., Asserting and Maintaining Social Needs, Controlling, Forecasting and Reasoning, and Projecting) even though the researcher was primarily concerned with Forecasting/Reasoning.

Classification Criteria for Coding Language by Function

In order that statements may be coded for function according to the system presented in Table 1, classification criteria needed to be established. Statements were coded for function using a combination of the following criteria: (a) literal content—subject, predicate, adverbial phrases, and other constituents, (b) intonation, facial expressions, and gestures of the speaker, (c) the nature of the activity and what was happening at a given time within the activity, and (d) the verbal and

nonverbal reactions of the speaker to the listener's response. In assigning function, for example, one is attempting to discover the speaker's purpose for speaking and often the actual words spoken do not reveal the intended function. If a speaker said, "I'm cold," this might simply be a statement of physical condition, or it might be a request to close the window or turn up the heat. The above criteria in combination were used to deterine the function. As all subjects, the researcher, and all research assistants were members of the same speech community, it was assumed that statements could be identified on the basis of these criteria.

Interrater Reliability

A separate research assistant from those persons who had videotaped and made the written transcript was employed to divide the language into statements, and a fourth research assistant was employed to categorize the statements by function. The researcher provided numerous practice transcripts and training sessions in the concept of a statement and the category system. Following these practice sessions, the research assistants independently segmented the language and categorized it by function. Subsequently, the researcher independently categorized a randomly selected sample of one-third of the transcripts, and the interrater reliability was found to be .96. Both of the research assistants were ignorant of the study's purpose or the proposed hypotheses.

Results

Initial interrogation of the data considered all language functions listed in Table 1 even though the researcher was primarily interested in the language function of Forecasting/Reasoning. Initially, Canonical Correlation Analysis was used to indicate association of variables. Canonical Correlation Analysis provides information on the relations between sets of variables and is often used as a first step in indicating the degree of association between these variables (Pedhazur, 1982). A Canonical Correlation Analysis was performed between the three grouping variables (i.e., school, grade, and treatment) and the eight language variables; which included four language functions under two conditions, problem-solving activities, hereafter termed "Science," and Art activities (i.e., Social Needs in Science (SNS), Controlling in Science (CS), Informing in Science (IS), Forecasting/Reasoning in Science (FRS), Social Needs in Art (SNA), Controlling in Art (CA), Informing in Art (IA, and Forecasting/Reasoning in Art (FRA)). The language function of Projecting was nearly nonexistent in the transcripts and therefore not subject to analysis. Multivariate normality assumptions were upheld by acceptable skewness measures; there were no missing data, multi-collinearity and singularity were absent from the squared multiple correlations of both sets; and plots of the canonical variates revealed no departures from linearity. However, kurtosis values indicated the presence of multivariate outliers within the variables: SNS (6.44), CD (4.15), IS (3.01), FRS (11.36), and SNA (.76). Seven of the 90 scores had z values greater than plus or minus three, and these scores were adjusted through the substitution of the adjusted means for the extreme scores (i.e., the data were Windsorized). Canonical Analysis, as in other multivariate techniques, is extremely sensitive to the presence of outliers (Tabachnick & Fiddell, 1983).

A subsequent Canonical Correlation Analysis with the adjusted data produced three statistically significant canonical correlations. The first canonical correlation was .82 (68% of the variance); the second was .76 (58% of the variance); and the

third was .48 (23% of the variance). Chi-square values were $X^2(24)=187.61$, $p<.001$ for the first correlation; $X^2(14)=93.59$, $p<.001$ for the second; and $X^2(6)=22$, $p<.001$ for the third. Analysis of the separate canonical variates is shown in Table 3.

Table 3
Correlations, Standardized Canonical Coefficients, Canonical Correlations Percents of Variance, and Redundancies Between School, Grade, Treatment, and Language Functions and Their Corresponding Canonical Variates

	First canonical variate		Second canonical variate		Third canonical variate	
	Correl.	Standardized Coeff.	Correl.	Standardized Coeff.	Correl.	Standardized Coeff.
Grouping set						
School	.227	.209	−.212	−.24	.951	.949
Grade	.820	.820	−.485	−0.485	−.303	−.303
Treatment	.532	.525	.841	.849	.096	.064
Percent of Variance	.34		.33		.34	Total=1.00
Redundancy	.23		.19		.07	Total=.49
Language Set						
SNS	.572	.343	−.131	−.089	.517	
CS	.647	.479	−.173	−.305	.253	
IS	.009	−.220	.338	1.006	.556	
FRS	.492	−.620	−.469	−.871	.442	
SNA	.518	.154	−.156	−.510	.426	
CA	.605	.268	−.181	−.156	.471	
IA	.357	−.138	.101	.352	.687	
FRA	.194	−.011	.195	.221	−.01	
Percent of Variance	.22		.06		.21	Total=.49
Redundancy	.15		.04		.05	Total=.24
Canonical Correlation	.68		.58		.23	

Note:
SNS—Social Needs: Science; CS=Controlling Science; IS=Informing: Science; FRS=Forecasting/Reasoning: Science; SNA=Social Needs: Art; CA=Controlling: Art; IA=Informing: Art; and FRA=Forecasting/Reasoning: Art.

Interpretation of the first canonical variate, with .4 used as the cutoff value, showed high correlation for Grade (.82) and Treatment (.532). The relevant language variables of the second set of variables of the first variate were, in order of magnitude, CS, CA, SNS, SNA, and FRS. The second canonical variate showed high correlation with Treatment (.84) and Grade (-.485). Among the language variables, only FRS had a high correlation. As expected, the third canonical variate had a high correlation only with School and was relevant to all language variables of the second set except CS and FRA. This initial Canonical Correlation Analysis suggested adjustments to the statistical procedures to enhance interpretability. Both Grade and Treatment received significant loadings on the first and second variate. The interpretability of grouping variables is enhanced through the use of Effect Coding (Pedhazur, 1982). Effect Coding was used to partition the levels of School, Grade, and Treatment in an effort to separate Grade and Treatment. The results of this second Canonical Correlation Analysis are shown in Table 4.

Table 4
Correlations, Canonical Coefficients, Canonical Correlations Percents of Variance, and Redundancies Between School, Grade, Treatment, and Language Functions and Their Corresponding Canonical Variates (Effect Coded)

	First canonical variate		Second canonical variate	
	Correlation	Coefficient	Correlation	Coefficient
Grouping set				
School 1	−.070	−.052	.898	.782
School 2	−.160	−.102	.610	.223
Grade: Kindergarten	−.070	0.0	.898	0.0
Grade: 3	−.160	0.0	.610	0.0
Treatment: Questioning	.986	1.041	.148	−.089
Treatment: Modeling	.408	−.114	.401	.436
Percent of Variance	.20		.42	
Redundancy	.12		.14	
Language Set				
SNS	−.167	−.090	−.739	−.647
CS	−.183	−.032	−.521	.499
IS	−.257	−.706	−.505	−.111
FRS	.687	1.081	−.364	−.154
SNA	−.128	.341	−.621	−.104
CA	−.141	.041	−.731	−.425
IA	−.247	−.212	−.750	−.467
FRA	−.258	−.190	−.111	.496
Percent of Variance	.095		.33	Totals: .425
Redundancy	.06		.11	Totals: .17
Canonical Correlation	.61		.32	

Note:
SNS—Social Needs: Science; CS=Controlling Science; IS=Informing Science;FRS=Forecasting/Reasoning: SNA=Social Needs: Art; CA=Controlling: Art; IA=Informing Art; and FRA=Forecasting/Reasoning: Art.

The first canonical correlation was .78 (61% of the variance); $X^2(32)=119.69$, $p<.001$. The second canonical correlation was .57 (32% of the variance; $X^2=41.43$, $p<.005$. No other canonical correlations were significant.

The first canonical variate showed high correlations on the treatments Questioning (.986) and Modeling (.408). The second canonical variate showed that Grade was not pivoted in the analysis, indicating an identity relation with School. Although statistically significant, the second variate is uninterpretable due to the high correlations on all of the language variables of the language set except FRS and FRA. It should be noted, however, that the interpretability of the relationship of Treatment to the language variables is an important result.

Given that Grade and Treatment were in close association on the initial analysis, and School and Grade were associated on the Effect Coded analysis, a 3 x 3 x 3 Fully-Coded Factorial MANOVA was run to test for School x Grade; School x Treatment; Grade x Treatment; and School x Grade x Treatment interaction with the language variables. The statistical package used was BMDP4V (Dixon, 1983) with a factorial design for the analysis. The results indicated that there were no significant interaction effects for the grouping variables (i.e., School, Grade, Treatment). Grade was shown to be significant $F(16, 112)=8.10$, $p<.001$ and with significant measures on all language variables except IA and FRA. Treatment

effects were significant, $F(16, 112)=7.10$, $p<.001$; however among the language variables only IS, $F(2, 63)=5.62$, $p<.0062$, and FRS, $F(2, 63)=21.86$, $p<.001$ showed significant treatment effects. School was not significant at the .01 level, thus eliminating it as a variable. This result did not conflict with the findings indicated in Table 3 because only the third canonical variate, which was uninterpretably due to the high correlations on all language variables except CS and FRA, was correlated with school.

Initial interrogation of the data also included an item by item analysis of variance to determine if FRA was a covariate with FRS—the problem-solving activity. The mean for FRS across all grades and treatments was 22.1 in terms of the number of statements categorized as Forecasting/Reasoning, while the mean for FRA across all grades and treatments was 2.72. A histogram of both variables indicated a range of 0-70 with 31 observations above 50 for FRS, and a range of 0-12, with 23 observations of zero for FRA. The correlation between FRS and FRA was .006. It was determined that language categorized as Forecasting/Reasoning during the art activity could not be used as a covariate with language categorized as Forecasting/Reasoning during the problem-solving activity (science). Accordingly, the language functions for science were separated from those for art in subsequent analysis.

As the study proposed three hypotheses, the following results relate more specifically to those hypotheses. Initial interrogation of the data using Canonical Correlation Analysis indicated general associations of the variables and the need for subsequent interrogation of the data to more specifically address the hypotheses.

Hypothesis 1: That the Amount of Language Used for Forecasting/Reasoning Would Differ Over Grade Level Averaged Over all Treatments was Accepted

The results of a MANOVA comparing grade level with the science variables at the .01 level of significance were as follows: $F(8, 156)=13.76$, $p<.001$. FRS with respect to Grade was significant: $F(2, 81)=8.89$, $p<.001$. To identify the source of variance between grade levels (i.e., K, 3, 6) an ANOVA of FRS with Grade was run. The results were as follows: $F(2, 87)=5.68$, $p<.0048$.

Table 5 indicates the means and standard deviations for the grade levels.

Table 5
Means and Standard Deviations for Language Used During Science for Forecasting/Reasoning Over Three Grade Levels

Grade	Mean	Standard Variation
K	24.37	15.32
3	28.37	13.67
6	16.10	14.08

A Pairwise Multiple Comparison test indicated the following results: Kindergarten compared with Grade Three ($F \leq 1.16$, $p=.2841$); Kindergarten compared with

Grade Six ($F=4.97$, $p=.0285$); and Grade Three compared with Grade Six ($F=10.925$, $p\leq.001$). Grade Three was significantly higher than Grade Six at the .01 level of significance.

Hypothesis 2: That the Amount of Language Used for Forecasting/Reasoning Would Differ Over Treatment Averaged Over all Grade Levels was Accepted

The results of a MANOVA comparing Treatment with FRS at the .01 level of significance were as follows: $F(2,81)=22.72$, $p<.001$. To identify the source of variance with respect to Treatment (i.e., Activity, Modeling, Questioning) and ANOVA of FRS with Treatment revealed the following: $F(2, 87)=18.22$, $p<.001$.

Table 6 indicates means and standard deviations for the three treatments.

Table 6
Means and Standard Deviations for Language Used for Forecasting/Reasoning Over Three Treatments

Treatment	Mean	Standard Deviation
Activity	16.20	12.40
Modelling	18.20	10.98
Questioning	34.43	14.82

A Pairwise Multiple Comparison test indicated the following results: Modeling compared with Activity ($F=.364$, $p\leq.55$); Questioning compared with Activity ($F=30.29$, $p\leq.001$); and Questioning compared with Modeling ($F=24.01$, $p\leq.001$). Questioning was significantly different from both Modeling and Activity, but no significant difference was found between Modeling and Activity. It should be noted that Canonical Correlation Analysis, the MANOVAS and the ANOVAS were convergent on identifying the association between Questioning and FRS.

Hypothesis 3: That the Amount of Language Used for Forecasting/Reasoning Would Differ Across Grade Level Across Treatment was Rejected

The results of a MANOVA comparing Grade by Treatment interaction for all science variables at the .01 level of significance was as follows: $F(16,239)=1.41$, $p\leq.1379$. FRS with respect to Grade across Treatment was as follows: $F(4,81)=2.43$, $p\leq.054$. There appeared to be no interaction effect.

Discussion and Implications

Developmental Differences in Language Used for Forecasting/Reasoning

The researcher had suspected initially that students' performance in using the language function of Forecasting/Reasoning would increase with chronological age and with the number of years in school, hence an increasing trend would exist between kindergarten and grade six. Conversely, the study indicated that students in grade six used significantly less language for Forecasting/Reasoning ($p\leq.001$) than did students in grade three. Further, if the significance level had been stipulated as .05, the grade six students would have used significantly less language for Forecasting/Reasoning ($p\leq.0285$) than students in kindergarten. This finding

again raises the issue of competence versus performance. It seems unlikely that the 12 and 13 year olds were unable to Forecast/Reason as well as the five and six year olds and the eight and nine year olds. With persons of normal intelligence the ability to solve abstract problems increases with age (Wells, 1981; Piaget & Inhelder, 1969); and problem solving was the essence of each activity labeled Science which was designed to elicit the language function of Forecasting/Reasoning. Perhaps the findings of this study do not indicate a problem of competence but rather a lack of performance. It seems unlikely, yet possible, that this lack of performance by the sixth grade students was caused by an inappropriate task, as the model city activity had been pilot tested with numerous children of this age range. Further, students appeared to understand the task and were highly motivated to accomplish it. During the activity, sixth grade students used sufficient language, yet it was for functions other than Forecasting/Reasoning. Perhaps students of this age are more concerned with socializing and this language for socialization overshadows all else; or perhaps the very process of schooling in some way inhibits students' performance in Forecasting/Reasoning. The study needs to be replicated and, if similar results are found, further research is needed to determine the reason for the six graders' lack of performance.

Besides the decline in use of language for Forecasting/Reasoning in grade six, an additional finding concerning grade level emerged. There was no significant difference between Kindergarten and Grade three in the amount of language used for Forecasting/Reasoning. Often teachers believe it is unwise to plan problem-solving activities for young children (e.g., kindergarten and grade one) as teachers feel these students are unable to participate successfully. The findings of this study indicate otherwise, at least within the context of oral language situations. Many kindergartners are able to solve problems and to reason quite effectively if presented with a situation that they understand.

Treatment Differences in Language Used for Forecasting/Reasoning

A second major finding of the study also has direct classroom implications. The treatment involving a questioning strategy was significantly more effective than either the activity alone or a modeling technique regardless of grade level ($p \leq 001$ in both cases when Questioning was compared with Activity and Modeling). Thus for both young children and older elementary children the most successful technique for eliciting language for Forecasting/Reasoning may be to focus the students' attention by specific questions within the context of an appropriate situation. Questioning strategies need not be a set format prepared in advance of a lesson, but may be used as a method for focusing attention on a given aspect of a task. Teachers need to internalize the strategy explained in Table 2 so that when students are engaged in a problem-solving activity, teachers can circulate and naturally engage students in talk which is relevant to the problem's solution.

The fact that the data was gathered during a single 50 to 60 minute session with each triad may have had some bearing on the results of treatment, particularly with respect to Modeling. The researcher must consider whether or not the amount of language used for Forecasting/Reasoning would have increased if modeling were carried out consistently over a period of time. Cazden (1983) has noted that models are valuable in helping children learn particular discourse forms needed in the school setting, but she does not discuss the factor of time needed to effect change.

Additional Findings

The fact that the language function of Projecting could not be used in initial Canonical Correlation Analysis because language for this function was virtually nonexistent, further strengthens the finding that except for the language functions of Social Needs, Controlling, and Informing which are present to some degree over all classroom activities, language function is highly sensitive to context (Staab, 1983). This notion was confirmed further by the fact that the art activity could not be used as a covariate; suggesting that the language function of Forecasting/Reasoning does not occur over a variety of situations but is elicited by carefully structured activities. Activities which elicit Forecasting/Reasoning contain the common essence of problem solving. Teachers need to be aware of this essence and to encourage children to problem solve in small groups when appropriate. Teachers cannot trust that language for Forecasting/Reasoning will occur naturally in the classroom but need to structure problem-solving activities within the context of the school curriculum. Teachers also need to internalize the questioning strategy embodied in Table 2 and be prepared to use it in informal situations as students are engaging in these problem-solving activities.

As students are encouraged to solve problems and as this activity becomes more of a reality in elementary classrooms, it is expected that children's performance in the use of language for Forecasting/Reasoning will be augmented.

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Conservers and Nonconservers: How Do Their Composition and Story Retelling Abilities Compare?

The purpose of this research was to examine various language relationships among grade two children at two levels of cognitive development (conservers and nonconservers). The subjects were selected from four classrooms in one suburban Winnipeg school and were pretested with the Goldschmid-Bentler Concept Assessment Kit—Conservation and then classified as nonconserver, transitional conserver or conserver. Each student was given several opportunities to tell a story, to retell a story, to dictate a story, and to write a story independently. These productions were analyzed with a variety of linguistic fluency and rhetorical quality measures. Measurable differences were found between conservers' and nonconservers' abilities in the four tasks.

Many children in grade 2 are preoperational (nonconservers) or concrete operational (conservers) in their level of thought (Piaget & Inhelder, 1969). The majority of children progress from one level to the next during the primary grade years. Since each level represents distinct thinking capabilities (Piaget, 1969; Piaget & Inhelder, 1969; Goldschmid, 1967), it would be useful for educators to know that such cognitive development is identifiable in the language fluency and rhetorical quality of the stories children of this age level tell, retell, dictate, and write.

The particular significance of the present study lay in the fact that it addressed the controversy (Stein & Glenn, 1978; Brown, 1975; Piaget & Inhelder, 1969) that memory rather than comprehension accounts for differences in recall protocols. In

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this study children were stratified through prior testing of their cognitive levels. Research which generated the controversy (Stein & Glenn, 1978; Brown, 1975) had studied children of a preoperational age (kindergarten and grade 1), but had not actually determined their level of cognitive functioning. In addition to the evaluation of the children's cognitive level, the cognitive dependence of the preoperational child upon observable stimuli was accommodated through use of sequentially ordered pictures in the story generation task. The pictures were absent in the second task, story retelling. In other words, the story generation task addressed the issue of the preoperational child's ability to comprehend sequential order in stories and the retelling task measured the preoperational child's ability to remember stories in sequential order.

Also of significance was the investigation of the effect cognitive levels of functioning had on four modes of story-language. Story-language modes referred to the tasks of story generation, retelling, dictation, and independent writing. These tasks are described in more detail in a later section of this article. Godwin (1963) and King (1978) indicated a need to focus research on the four facets of language—speaking, listening, writing, and reading. Through the four story-language modes, it was possible to encompass these four language arts. Hence this study represented an expansion from comparison of two story-language modes (Brown, 1975) and three story-language modes (King & Rentel, 1981) to comparison of four story-language modes.

Its primary purpose was to address the notion that the cognitive level (preoperational or concrete operational) of young children influences their ability to recall the logical sequence found in stories (Piaget & Inhelder, 1969). The effect cognitive level exerted on a child's story-language behavior was analyzed through the child's ability to generate, retell, dictate, and write stories.

A secondary purpose was to examine the quantitative and qualitative aspects of the language generated in the four modes. This purpose was accomplished by measuring the microstructure, or language output, through use of the T-unit and dependent clause (Froese, 1984; Loban, 1976; Hunt, 1965), and the macrostructure through the use of Rumelhart's (1975) story grammar (i.e., setting, initiating event, reaction, action, and consequence).

Method

Research Questions

Two specific questions guided the research:

1. Are children classified as conservers able to provide more language output in the four modes (story generation, retelling, dictation, and writing) than nonconservers?
2. Are children classified as conservers able to provide a greater incidence of specific macrostructures in the four modes (story generation, retelling, dictation, and writing) then nonconservers?

Subjects

The subjects in this study were 35 grade 2 children from four individual classrooms in one suburban Winnipeg school. Through prior testing of a sampling of 51 of the 92 grade 2 children with the Goldschmid-Bentler Concept Assessment Kit—Conservation—Form A, it was possible to classifv them as 11 nonconservers (Score 0-6), 12 transitional conservers (Score 7-10), and 12 conservers (Score 11-12).

Procedure

Each of the conservers and nonconservers provided a total of twelve story-language samples while the transitional conservers provided six story-language samples. The transitional conservers were not specifically the object of this study; therefore, smaller samples were taken for possible explanatory purposes. The four modes of language: story generation, retelling, dictation, and writing were collected weekly for three consecutive weeks. The story generation task required each child to tell a story based upon a logically sequenced set of 15 black and white pictures from one of three textless picture books by Fernando Krahn (1981, 1977, 1974). The tape-recorded story was later transcribed. The story retelling task was the child's recollection of the story composed with the aid of the picture sequence. This story was retold without the aid of pictures to a second adult who had not been present at the child's first storytelling. The story retelling was again tape-recorded for later transcription. The story dictation task was the child's opportunity to compose a story as the researcher transcribed it, while the writing task enabled the child to compose and transcribe a story. As a result, two stories were produced in an oral context while two other stories were developed under the constraints of transcription. Moreover, there were four stories collected per week from each child classified as a conserver or nonconserver under four different circumstances, and two stories per week were gathered from children classified as transitional conservers through story dictation and writing.

Each of the stories was analyzed according to seven measures of linguistic quantity and complexity of syntax (also referred to as language output): Total Number of T-units, Total Number of Words, Mean T-unit Length, Total Number of Mazes, Total Number of Words in Mazes, Total Number of Dependent Clauses, and Mean Dependent Clauses per T-unit (Loban, 1976; Hunt, 1965); and five rhetorical quality measures of story macrostructure: Setting, Initiating Event, Reaction, Action, and Consequence (Rumelhart, 1975).

Results

Research Question 1

Children who were classified as conservers were found to use a greater Total Number of Words and Total Number of Dependent Clauses than did children classified as nonconservers in the four story-language modes combined.

The results of the two-way analysis of variance (B.M.D.P. 2V, Dixon, 1982) revealed that there were statistically significant differences ($p<.01$) between conservers and nonconservers with regard to two measures of language output, the Total Number of Words ($F[1,21]=10.05$, $p<.005$) and the Total Number of Dependent Clauses ($F[1,21]=7.61$, $p<.012$) in the four modes (story generation, retelling, dictation, and writing) combined. Table 1 presents examples of the comparative mean T-unit lengths for conservers and nonconservers.

King and Rentel (1981) delineated three steps in the young child's journey from oral to written language with the first being the ability to sustain an utterance unsupported by prompting, questions, and feedback. This step related well to the Total Number of Words used. Moreover, if children who were classified as conservers were able to express utterances of significantly greater length in

Table 1
Mean T-unit Length of Conservers and Nonconservers in Four Language Modes

Mode	Conserver	Nonconserver
1. Dictation	9.527	8.817
2. Independent writing	8.360	7.023
3. Telling	8.180	7.473
4. Retelling	8.253	7.180

comparison to those used by nonconservers in the four modes of story generation, retelling, dictation, and writing, then it would seem that this verbal ability was of assistance to the conserver in all four story language tasks and exemplified the first stage referred to by King and Rentel (1979).

The statistically significant difference between conservers and nonconservers in the Total Number of Dependent Clauses used in the four modes of story generation, retelling, dictation, and writing combined may be considered an indirect indication of increased linguistic maturity. Hunt (1965) concluded that the mean T-unit length was an index of linguistic maturity which grew in length due to an increase in subordinate clauses. It is noted that dependent clauses (subordinate clauses) were produced with a statistically significant difference by conservers when compared to nonconservers, a situation which may indicate that conservers were beginning to be able to consolidate more thought into longer units. Hunt (1965) claimed that, "Unless we suppose that there is less thought per word in the writing of older students then we must suppose that as students mature they learn to incorporate a larger and larger body of thought into a single related organization."

The reason that it is suggested that conservers were *beginning* to consolidate more thought into longer units is that there should also have been a statistically significant difference between the two developmental groups with regard to the measure of the Mean T-unit Length but this was not the case in this study. Nevertheless, all means favored the conservers.

Research Question 2

The children who were classified as conservers used the story macrostructure categories of Initiating Event and Reaction more often in the four story-language modes combined (story generation, retelling, dictation, and writing) as compared to children classified as nonconservers. Furthermore, conservers used the Initiating Event macrostructure category more frequently in the recall task (story retelling) as compared with either the story dictation or writing tasks. Nonconservers, on the other hand, showed no difference between their use of any of the story macrostructure categories in their story retellings as compared with the stories they dictated or wrote.

A two-way analysis of variance (B.M.D.P. 2V, Dixon, 1982) indicated that two macrostructure categories, Initiating Event ($F[1,21]=7.82$, $p<.000$) and Reaction ($F[1,21]$–8.80, $p<.007$) were statistically significant for conservers as compared to

nonconservers in the four modes combined. Table 2 presents the means for the two significant categories. Comparing these findings with those of Stein and Glenn (1978), it is noted that in the Stein and Glenn study the Initiating Event macrostructure category was the third most readily recalled category, while the Reaction macrostructure category, which in the present study was more like Stein and Glenn's Internal Response category, was the fourth most likely to be remembered category, and one which fifth graders recalled significantly ($p<.05$) more often than first graders. Since, in the present study, conservers tended to make significant use of Initiating Event and Recreation macrostructure categories in all four modes as compared with nonconservers, conservers' usage of the two macrostructures may be indicative of a more advanced level of functioning more comparable to that of grade 5 children than to the grade 1 children studied by Stein and Glenn (1978).

way analysis of variance, indicated that there was a statistically significant effect due to Developmental level ($F[1,21]=7.92$, $p<.000$) and that there was also a statistically significant interaction between Developmental level and Mode ($F[3,63]=6.94$, $p<.005$), the interaction was probed by means of multiple t-tests ($\alpha=.01$). The result of these analyses indicated that, for conservers, the story generation and retelling tasks had a statistically significant incidence of the Initiating Event macrostructure as compared to the tasks of story dictation and writing while, for nonconservers, the incidence of the initiating Event macrostructure was statistically significant in the story generation task as compared to the tasks of story dictation and writing. In other words, with the use of pictures (story generation) both development levels utilized the Initiating Event macrostructure, but when the pictures were no longer present (story retelling) the conservers alone demonstrated a use of the Initiating Event macrostructure.

Table 2
Means and Standard Deviations for the Initiating Event Category and the Reaction Category

Mode	CONSERVER				NONCONSERVER			
	Initiating Events		Reaction		Initiating Events		Reaction	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
1. Dictation	5.00	1.76	3.08	2.07	4.91	3.18	2.82	2.56
2. Independent writing	3.67	1.44	4.08	2.78	3.73	2.53	2.73	2.05
3. Telling	13.25	5.14	3.83	2.92	8.73	2.57	1.64	1.12
4. Retelling	13.83	7.15	3.33	3.31	6.45	3.72	1.00	1.10

The previously mentioned finding seems to support the suggestion by Piaget and Inhelder (1969) that preoperational thinkers (nonconservers) are stimulus bound; that is, when the visual stimuli were present in the story generation task, the nonconservers were able to identify and utilize the Initiating Event macrostructure category, but when the stimuli were no longer visible, as in the story retelling, the nonconservers were unable to utilize this macrostructure category. On the other hand, the concrete operational thinkers (conservers) were able

to produce the Initiating Event macrostructure when the stimulus was present in story generation and when it was absent in story retelling. Brown (1975) observed that recognition of a story through reviewing pictures was an easier task for kindergarten children who, it would be presumed, were preoperational thinkers than free recall in the absence of pictures, while grade 2 children were able to recall call from memory equally as well as they were able to reconstruct or recognize a story through use of pictures. Furthermore, in the present study it should be noted that use of visual stimuli made a significant difference in the incidence of the Initiating Event macrostructure for both developmental levels. The two story tasks (dictation and writing) which did not use visual stimuli were shown to have a statistically less significant incidence of the Initiating Event macrostructure when compared to the task (story generation) which used picture stimuli. This observation seems to stress the value of using visual stimuli to develop young children's recognition and use of narrative structure as has been observed by Poulsen, Kintsch, Kintsch, and Premack (1979), Brown (1975), and Smith and Bean (1983).

Conclusion and Implications

It was found that there was a measurable difference between conservers and nonconservers in the stories they generated, retold, dictated, and wrote. Conservers, with regard to linguistic quantity measures, used a greater Total Number of Words and Total Number of Dependent Clauses than did nonconservers in the four story-language modes combined. With regard to rhetorical quality measures, conservers used the macrostructure categories of Initiating Event and Reaction more often at a statistically significant level as compared with nonconservers. It was also found that the use of visual stimuli aided nonconservers to produce the Initiating Event macrostructure category in story generation, but when the visual stimuli were absent in story retelling, the nonconservers did not remember the Initiating Event macrostructure category. Conservers, on the other hand, used the Initiating Event macrostructure category at a statistically significant level in story generation and retelling.

This study suggests that the story macrostructure categories provide a framework with which to analyze the children's stories to determine whether all the necessary parts of the narrative are present and to what degree each part is present. Such analysis indicates the child's internalized level of story comprehension and provides clues as to which structures may require classroom instruction.

The T-unit appears to be a useful measure for quantifying the microstructure of narrative discourse. This measure gives the teacher some insight into the structural, linguistic, and rhetorical complexity of the child's language by which to chart individual or group process. It also allows comparisons to be made across modes; that is, across the categories of telling, retelling, dictating, and writing.

Most revealing, however, is the cognitive level of the student. Nonconserving second graders in this study performed at levels somewhere between those of first-graders (Froese, 1984) and the conservers in this study in their language activities. Whether a child is at a concrete operational level or a preoperational level is an important variable affecting the child's language development. Therefore, teachers of language arts would be well advised to be sensitive to such differences and consider them in their teaching methodology. Concrete mnemonic devices such as pictures to aid the writing process may be even more important than was previously realized.

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Understanding of Selected Pre-Number Concepts: Relationships to a Formal Music Program

Children at prekindergarten and kindergarten levels who were enrolled in a formal music program based in part on the philosophies of Zoltan Kodaly were individually administered a test containing items relative to the prenumber concepts of comparison, order, classification, and pattern. The test was also given to a control group of children. Females in the experimental group who were at the kindergarten level attained significantly higher scores than experimental-group males and control-group females.

One of the areas of learning in which some parents have made arrangements for their preschool age children to take formal lessons is the field of music. In a number of situations, such lessons start as early as the age of three years. In addition to the development of concepts in music, it would seem that these children are being introduced to concepts which are the foundation for other subject areas such as mathematics and reading.

It is generally agreed that a child's understanding of number concepts such as equivalence, cardinality, number order, and ordinality, are enhanced by previous experiences with activities based on the prenumber concepts of comparison, order, classification, and pattern. The number concept of comparison is based on an understanding that two numbers are either equal or one is greater than the other. The prerequisite prenumber concept of comparison can be taught by having children compare lengths and thicknesses of wooden dowels. The number concept of order is based on an understanding that two or more numbers can be sequenced so that each successive number is one greater than the previous number. Experiences with sets of wooden dowels of varying lengths and thicknesses are helpful in developing a child's understanding of the prenumber concept of order. The concept of number classification is based on the idea that one numeral can represent a variety of physical representations. For example, sets of three large marbles, three small boxes and a set of one pencil, one eraser and one ruler can all be represented by the numeral

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"3." Each of these sets may be classified on the basis of "threeness." The prerequisite prenumber concept of classification can be taught by having children sort geometrical figures on the basis of color, shape, or size. Finally, the concept of number patterns, exemplified by counting by twos, fives, tens, and so forth , is more easily understood if children have prenumber patterning experiences such as adding to an established linear sequence of geometrical figures.

Observation of children who were enrolled in the Alberta College Early Childhood Music Program, which was founded in Edmonton in 1973 by Carmen Bourret and based, in part, on the philosophies of Zoltan Kodaly, indicated that many of their musical experiences were closely related to three of these four prenumber concepts, comparison, order, and pattern. Comparison of sounds is a common activity. Is the sound made by a drum or a shaker? Is the shaker made of metal or glass? Are there grains of rice or pebbles inside? Children may be asked to compare loud and soft sounds, a fast or slow beat, a short or long sound. Examples of tonal order are found in Twinkle, Twinkle Little Star (sol-fa-mi-re-do) and in Barley, Barley (la-sol-fa-mi-re-do). Pattern activities are so numerous that one can consider several categories. The songs Rain Rain Go Away, One Two Tie My Shoe, and See Saw Up And Down all have the rhythm pattern ♩ ♫ ♩. Bobby Shaftoe, Twinkle, and Old MacDonald have the pattern ♩ ♩ ♩ ♩. Meter and emphasis patterns can be 3/4 (strong, weak, weak) as in Lavender's Blue, or 4/4 (strong, weak, medium, weak) as the Hot Cross Buns. The tone pattern sol-mi is the basis of Rain Rain. Hot Cross Buns is an example of the tone pattern mi-re-do. Since the musical activities described provide experiences related to the prenumber concepts of comparison, order, and pattern, it is hypothesized that children who are enrolled in an early childhood music program will have a better understanding of prenumber concepts than children who don't have these experiences. For the purposes of this study, the experimental subjects are children enrolled in the Alberta College Early Childhood Music Program.

Related Research

Kokas (1969) conducted tests of observation and movement with children aged from 3 to 6 years. The experimental music groups made fewer errors than the related control groups when they were asked to match animal pictures and names and to duplicate patterns of familiar figures. Experimental groups had higher scores than control groups in imitating movement, recognizing rhythms of movement, and making stick designs to imitate movement. None of the differences was significant. Hurwitz, Wolff, Bortnick, and Kokas (1975) compared the performances of two matched groups of grade one children on tasks of sequencing and spatial abilities. Results indicated that the experimental music group had significantly higher scores than the control group on tests of tapping sequences, duplicating a sequence of pictures, or colors, and on the spatial tests in the Raven Progressive Matrices and Graham Kendall Memory for Designs batteries. Sex differences were also reported in which experimental-group males demonstrated a significantly better level of performance than control-group males. The experimental groups in both of the Kokas and Hurwitz studies were drawn from Kodaly-based music programs.

Bain (1978) reported that significant differences favoring experimental music group kindergarten age children over control-group children indicated that "early music training serves to increase sensitivity to a child's inner dynamics, to create

more flexible means of using the body-as-a-tool to achieve cognitive goals." He also found no differences between experimental and control groups on tests of conservation of space, number, substance, continuous and discontinuous quantity, and weight. The experimental group in the Bain study was drawn from a modified Suzuki-Kodaly music program.

Pilot Study

Prior to embarking on the present study, a pilot study (Neufeld, 1984) was conducted with an experimental group of children who were studying violin with the Society for Talent Education, a program based on the philosophies of Shinichi Suzuki, and a control group of children who were attending a day care centre. At the prekindergarten level, the difference in scores between the two groups on a set of items based on prenumber concepts was minimal. At the kindergarten level, the difference in scores between the two groups was considerable, favoring the children with formal musical experience. There was no consistent pattern of sex differences. Although the experimental groups in the pilot study and the regular study were drawn from programs based on different philosophies of teaching music, it was felt that both programs emphasized concepts which were related to the learning of mathematics.

Administration of the Instrument

During the months of February, March, April, and May 1984, a test developed by the author was individually administered to 130 children. All 30 items on the test were based on three-dimensional materials. The test took approximately 20 minutes to administer.

The test items were based on four concepts which are generally considered as prerequisite to grade 1 number concepts. The instrument consisted of two categories for the order concept (length and thickness) and two classification categories (one-difference and four-differences).

1. Comparison (8 items)
   a. Which of these two sticks is longer?
   b. Which of these two sticks is thicker?
2. Order (6 items)
   a. Which of these three sticks goes in between?
      (2 greater and 2 lesser in order)
   b. Which of these three sticks goes last?
      (4 greater in order)
   c. Line up these five sticks from longest to shortest; thickest to thinnest.
3. Classify
   a. one-difference (6 items) (shape, size, thickness)
      Which one (of these four) does not belong? (eg., 2 squares/
      2 circles, 2 large/2 small, 1 thick/3 thin)
   b. four-differences (4 items) (shape, size, thickness, color)
      Which one (of these four) does not belong? (Note: Each one
      doesn't belong for a different reason.)
4. Pattern (6 items) (shape, size, thickness)
   Which one (of these three) is the missing one?

(eg., a sequence of 4 blocks repeated with one block missing)

Results

The results summarized in Table 1 are based on 40 children in each of the experimental (E) and control (C) groups. The scores of ten children of each sex from each of the prekindergarten and kindergarten settings were analyzed. The experimental kindergarten group had an average of two years of formal musical experiences. The experimental prekindergarten had an average of one year of formal musical experiences. None of the control-group children was enrolled in a formal music program.

Table 1
Percentage Scores by Subgroup and Test Category

	Prekindergarten				Kindergarten			
	Male		Female		Male		Female	
	E	C	E	C	E	C	E	C
Order (length)	70	63	70	73	83	83	73	77
Order (thickness)	47	53	67	83	73	90	93	90
Classify (1-diff)	43	47	35	42	60	55	65	53
Classify (4-diff)	45	53	45	55	65	70	93	63
Pattern	60	43	35	50	40	48	53	40
Average	52	50	46	56	60	64	72	60

Initially a total of 112 children were tested. From this group, particular children were selected on the basis of similarity of sex and age at the time of testing. The scores for each of the categories of the test are reported as average percentages of the scores of the ten children in a particular subgroup. The bottom row of the table indicates the average percentage based on 22 test items. The scores on the eight items covering the comparison concept were not included in the analysis because all children answered all items correctly.

Table 2 shows the ages for subgroups and total groups. The mean age for each of the control subgroups is approximately two months greater than for the respective experimental subgroups. This relates to the fact that the mean test date for the control subjects was approximately two months later than for the experimental subjects.

Treatment differences were analyzed using a one-way analysis of variance procedure. For the prekindergarten males, there were no significant differences between the control and experimental groups. For the prekindergarten females the control group scored higher than the experimental group on all five categories although none of the differences was significant.

Table 2
Age in Months by Subgroups at Time of Testing

Prekindergarten				Kindergarten			
Male		Female		Male		Female	
E	C	E	C	E	C	E	C
53.5	55.7	55.0	57.7	68.0	70.6	67.0	69.6

For the kindergarten males, there were no significant differences between the control and experimental groups. For the kindergarten females, the experimental group scored significantly ($p<.01$) higher than the control group on the concept of one-difference classification. In addition, the experimental group scored significantly[1] higher than the control group when the total scores for all five categories were analyzed.

Sex differences were analyzed using a one-way analysis of variance procedure. In the prekindergarten control group, females scored significantly higher than males on the concept of order by thickness. Females scored higher than males on all of the other five categories although none of the differences was significant. In the kindergarten control group, males scored higher than females on four categories although none of the differences was significant. Males and females had the same mean score on one category.

In the prekindergarten experimental group, males scored significantly higher than females on the concept of pattern. On the other four categories males and females scored higher, but not significantly, on one category each, and had identical means scores on two categories. In the kindergarten experimental group, females scored significantly higher than males on the concept of four-difference classification. In three of the other four categories, females scored higher than males although differences were not significant. In addition, and unlike any of the other three groups, females scored significantly higher than males when the total scores of all five categories were analyzed.

Summary

At the prekindergarten level, the differences between the experimental and control groups were minimal. There was no consistent pattern of sex differences at this level although the mean scores of control group females were slightly higher than the mean scores of control group males in all categories.

At the kindergarten level, the differences between the scores of males in the control and experimental groups were minimal. For females, the scores of the experimental group were higher than the scores of the control group in four of the five categories. For the concept of four-difference classification and for the total score over all categories, the differences were significant.

There was a consistent pattern of sex differences at this level. For the control group, the mean scores of males were higher than the mean scores of females in all categories except one, although none of the differences was significant. For the

experimental group, the mean scores of females were higher than the mean scores of males in all categories except one. Differences favoring females were significantly higher for the concept of four-difference classification and for the total score.

Conclusion

It is concluded that females who have been in a music program for one year, followed by a combined year of music and kindergarten, have a better understanding of the total set of prenumber concepts than males with similar music and kindergarten experiences. It is also concluded that these females have a better understanding of the total set of prenumber concepts than females with similar kindergarten experiences but no formal music experience.

At the prekindergarten level it is concluded that there is no difference in the understanding of the total set of prenumber concepts between children who have been in a music program and those who have not. On the basis of this similarity between experimental and control-group subjects, it is concluded that children who were given the opportunity to participate in musical experiences did not exhibit any advantage in their initial understanding of prenumber concepts. It is further concluded that the change in understanding of these concepts was brought about, at least in part, by the musical experiences encountered during the complete preschool music program.

One can only speculate about reasons why a formal preschool music program is more beneficial to females than to males in enhancing an understanding of prenumber concepts. Perhaps society makes it more acceptable for females to express themselves through music than males. When females are given the opportunity to expand and concentrate this expression in a formal music program which emphasizes several concepts that are shared with a prenumber program, then their understanding of these shared concepts would appear to be enhanced.

Note

1. $p<.05$ unless otherwise indicated.

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PERSPECTIVES

Mainstreaming and the Education of Deaf Students

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Recent attempts to integrate special education students into regular education involve considerable risk where deaf children are concerned. Although we do not suggest mainstreaming be eliminated, unselective application may be counterproductive to the goal of effective education. This article suggests a policy of mainstreaming deaf students as an alternative placement in a diverse educational system, a system which retains schools for the deaf as a part of a wide spectrum of services.

Many deaf people and some professionals working with deaf students reject the practice of mainstreaming. This article will support this argument, not because mainstreaming is undesirable, but because as presently practiced, it offers little benefit to many deaf students. Such students are not hard of hearing. They are those students with little or no residual hearing, whose disability precedes the acquisition, at approximately three years of age, of oral speech and oral language. Only one in 10 of these students will be born to deaf parents. The large majority will have hearing parents—parents dependent for information about deafness on professionals who rarely have reasonable understanding and empathy for the status, problems, attitudes, and values of an adult deaf person. These professionals,

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many of whom are not trained as teachers of the hearing impaired, generalize from the experiences of other disability groups and of hearing parents of deaf children. They ignore or neglect the point of view presented by the deaf community, a point of view related to personal experience, but which has a developing base in quantitative data.

Oral Approaches to Education

The use of speech and lip reading is widely advocated as a method of educating deaf students. Deaf people themselves value such skills, so it is important to distinguish between oral approaches to deaf education as a philosophy, and the use of such approaches to the exclusion of the effective use of sign language systems in classrooms and elsewhere. Indeed, Conrad (1979) discusses the threat that sign language can present to some hearing people. He refers, for example, to the "signing alternative, which is then usually suggested as a last resort, [and] is also regarded as dangerous, almost hostile; teachers feel superstitiously threatened by its use" (p. 310). Quotes are provided to support this hypothesis, a particularly revealing one being from van Uden (1970)—"building up a primitive own world view, different from ours." These fears have not only influenced the education of deaf students, but also other areas of special education. For example, discussing the case of Nadia, a young autistic girl whose extraordinary artistic skills were destroyed by intensive language training, Lyall Watson remarks:

> Our entire educational effort seems to be dedicated to making others over in our image, turning out carbon copy people who faithfully reproduce all our mistakes. "Better," we seem to be saying, "a poor imitation of ourselves, than something different, something threatening." An eminent child psychologist sums up Nadia's case by concluding that, if the loss of her gift is "the price that must be paid for language . . . we must, I think, be prepared to pay that price on Nadia's behalf." . . . Must we? I am far from convinced. (1979, p. 34)

Unfortunately, such feelings can easily be exploited. A disturbing discussion of the work of Conrad is found in the *Volta Review*, a journal read by many parents of hearing impaired children. In a section entitled "Forum," an article by Arnold (1983) is headlined "Does Pure Oralism cause Atrophy of the Hearing Impaired Child's Brain?" The title is an oversimplificaiton of a complex scientific issue presented as a tentative hypothesis. However, the important point is not the scientific question, but its editorial presentation in a manner and form which may play upon the understandable fears of parents about the consequences of deafness for their child.

Nash and Nash (1981) bring a note of sense and reality to this discussion by analyzing the motivation of ardent adherents of oral only education and of social intercourse. "Oralism as a formal system emerged to account for the presence of a deaf child in a hearing family in a way that would allow the parents to continue their understanding of parenthood virtually unchanged (p. 24). At birth or shortly thereafter, a contract is entered into that is supportive of middle class values. 'Work hard, your child will become verbally fluent [in speech] and, therefore, occupationally and socially successful.'" The contract has an additional advantage for the professional, as it shifts ultimate accountability to the parent. If the student is not orally successful, the home environment is the reason. Again Nash and Nash express it eloquently:

> Thus a circle is established that continually attributes blame for lack of success to the parents, who, regardless of how hard they work, fail to produce a "speaking" person like themselves. In fact, it can even be suggested that the more work done by the parents, the more guilty they feel. Within oralism, of course, the process just described dovetails with some parents' ideas about what might have caused deafness in the first place; for example, "We did something to cause this condition," or "We must have sinned and are being punished." (1981, pp. 24-25)

The argument comes full circle, as is clearly shown in the study of Bernstein and Henderson (1969). When uninformed hearing people are questioned about the consequences of deafness, middle class respondents focused on verbal deficiency and working class respondents on thinking processes. Consequently, it is possible to speculate that the early class backgrounds of professionals in the field of deafness might reveal more about the nature of the debate of oral methods of education than arguments about speech processes or the linguistics of sign language.

The motivation to reinforce sociocultural values which emphasize the importance of speech and verbal fluency, and occupations which are highly dependent on these attributes, can be contrasted with the much greater need for parents and families to reorient the dynamics of the family to permit acceptance and integration of the deaf child. Harris (1982) has summarized this process as including: (a) the parents' ability to deal with grief and reach mature acceptance of deafness; (b) the availability of family crisis intervention support; (c) the availability of a supportive social network; and (d) providing the opportunity to make informed choices about communication methods and language development. A focus on speech development alone frequently prevents families from dealing with these other aspects of their relationship with a deaf child. When this happens, the long-term consequences are often tragic.

Ethnicity and Education

In developing a policy which limits the choice of deaf students to only mainstream placements, many hearing people and educational administrators fail to understand that deaf people regard themselves as an ethnic group rather than as disabled or handicapped. Ethnicity associates with a separate language, American Sign Language (ASL), and with the existence of national and local, social, political and other networks. However, the deaf ethnic group differs in one important respect from most other similar groups—membership by birth is rare (as we noted earlier only about 10 percent of deaf children are born to deaf parents). Therefore, enculturation by parents is also rare, and indeed, in some respects parents may have to be enculturated by their adolescent children, or by deaf adults. Erting (1978) emphasized some other significant factors of deaf ethnicity: (a) it is the inability to speak rather than the inability to hear to which the stigma of deafness attaches itself; (b) only a minority (approximately 12 percent in the U.S.A. and less elsewhere) of teachers of hearing impaired students are themselves deaf; and (c) indeed, training programs for teachers of hearing impaired students have systematically discriminated against deaf and hard of hearing applicants. The resulting educational policies prescribe English, in oral or manual form, as the dominant language of instruction.

The parallels between the use of English and the rejection of West Indian Creole and the rejection of British Sign Language in schools for the deaf in the UK have been explored intensively by Ladd and Edwards (1982). The origins for the "creolization" of British Sign Language are found in the verbal and nonverbal cuing

which identifies for deaf people and others their low social status, and Ladd and Edwards draw comparisons between negative attitudes towards deaf and West Indian people, and the derogatory attitudes shown towards their languages by teachers and educational administrators. One of the unfortunate effects of this situation, according to Ladd and Edwards, is the internalization of these negative attitudes by the minority group. Therefore, "West Indians, particularly the educated West Indians, are among the severest critics of their own community's speech. Many deny all knowledge of Creole" (p. 112).

In the orally dominant schools that have been, and are still a characteristic of Great Britain, the students of each school develop their own idiosyncratic language structures. Teachers mostly communicate only in a pidgin language, usually oral but often supplemented or reinforced by signs. More confusion is engendered by adding two distinct forms of manually coded English into the British educational system—the Paget Gorman Sign System and Signed Systematic English. However, at no point have teachers incorporated into the classroom the formal sign language of the adult deaf community, which has primarily been retained in the institutes (clubs) for adult deaf people. As a result "most deaf people are forced to recreolize BSL in every generation" (p. 112). The situation in Canada is similar, but less extreme.

There are severe educational consequences resulting from the attitudes discussed in the previous paragraphs. Both West Indian and deaf students are severely retarded educationally, and such retardation results, at least in part, from an educational system that is totally predicated on the use of standard English. To support their contention, Ladd and Edwards (1982) cite some interesting parallels—(i) when using their own language the students are perceived to be less intelligent and badly behaved; (ii) the students are described as "nonverbal and inarticulate," but teachers also complain that they never stop talking in their own language; (iii) standard English is the model of use and success, and the Creole is often banned in the classroom; (iv) when the Creole language is used, attempts are made to ensure that it is used "properly" which means that it is distorted to conform to the syntax of spoken English; and (v) comments are made about the "lack of spontaneity" in written expression without associating this problem with hypercorrection of spontaneous language structures.

Of particular significance is the effect of the values just described on academic learning. Learning becomes the process of correction of incorrectly produced speech patterns or manual English, not a process of assimilation and comprehension. The constant focus by the teacher on English results in "a child who reads for accuracy of pronunciation and not for meaning" (p. 119). The student is not given the opportunity to develop his spontaneous understanding of the grammatical rules of language. Artificial language structure completely dominates and, as a result, language function is lost. This limited language function then reduces the student's ability to benefit from academic and other forms of instruction, and by exposing the child to an English language dominated education, mainstreaming may increase rather than reduce his/her ability to benefit from formal instruction.

Educational Policy and Mainstreaming

Kaufman, Gottleib, Agard, and Kuric (1975) state: "Mainstreaming refers to the temporal, instructional and social integration of exceptional children with normal peers. It is based on an ongoing individually determined educational needs assessment, requiring clarification of responsibility for coordinated planning and programming by regular and special education administrative, instructional and support personnel" (p. 40-41). The idea is not new in the education of deaf students.

Johann Baptist Graser (1766-1841), a Bavarian educator, introduced one of the first formal attempts at mainstreaming deaf children into regular schools. In 1821 he established an experimental school for the deaf within a regular school in Bayreuth. Its purpose was the gradual placement of deaf children in regular classes, and the teachers were to be trained to teach both deaf and hearing pupils. The concept was enthusiastically accepted and put into wide practice in many public schools throughout Germany. However, it went out of fashion when it was observed that deaf children failed to maintain the same progress as their hearing peers (Bender, 1981). In Canada, at the turn of the century, an early experiment placed deaf students in a classroom with hearing students in a regular industrial training school. Unfortunately, we do not know if the experiment was successful as the school, the Fredericton Institution for Education of the Deaf and Dumb in New Brunswick, closed, and the students were transferred to the Halifax School for the Deaf in Nova Scotia (Rodda, Ellis, & Chaddock, 1983). Other early unsuccessful experiments are fully reported by McLaughlin (1980) and Pritchard (1963), and Brill (1978) describes more recent methods used for the selection and placement of mainstreamed students.

If students are appropriately placed in mainstreamed settings, there can be advantageous results, but when mainstreaming reflects a desire to assimilate rather than integrate and thereby deny the experience of deafness, the practice can and does become counterproductive. "The rationale of any mainstreaming program must consider the child first. A child's communicative needs must be satisfied. The child [then] provides the rationale for placement within a setting consisting of others with similar communicative preference. The setting is [then] viewed as a normal and appropriate environment" (Stewart 1984, p. 101).

Mainstreaming is often an extension of the values associated with the extreme oral position. In particular, it frequently rejects the use of sign language, and even when it does not, the mainstream situation provides few opportunities for deaf children to use sign language intensively or in a variety of different settings (Carver, 1984). A language does not make a culture or a subculture, but it is an important aspect of it. Similarly, a culture or subculture does not make a person, but it is an important aspect of his/her development. As Barbara Kannapell has said: "I believe my language is me. To reject a language is to reject the person himself or herself" (1980, pp. 11-12).

The common North American model for mainstreaming is the Cascade system. In Canada, much of the impetus for this system came from Wolf Wolfensberger's classic book, *Normalization*, published in 1972. Wolfensberger's main thesis urged the acceptance of handicapped people as equals rather than advocating a particular educational policy, but it was widely interpreted as supporting mainstreaming. If we contrast the diagrammatic representation of the Cascade system with the less well-known model developed in Britain by Gunzberg and Gunzberg (1973), an in-

teresting difference emerges (see Figures 1 and 2). The Cascade system is invariably drawn in an administrative or structural mode. Where the student fits in the system is of lesser importance than his level of achievement in educational and social skills. The regular class merges into residential provision and then into a hospital setting. The Gunzberg model is drawn in a developmental and functional mode. The two are not, of course, necessarily opposed, but they can be if we assume that a hierarchically structured pattern of services enables us to make judgments about "the least restrictive environment" required by classic legislation mandating mainstreaming, such as PL 94-142 in the USA and Bill 82 in the Province of Ontario. The least restrictive environment is then defined by the match between students and the programs of the institution; by arbitrary rather than predefined criteria.

Possibly, the influence of the Cascade model has lead many to conclude that schools for the deaf are institutions and, as such, are undesirable. Both premises are suspect. Miller and Gwynne (1973) in their seminal study *A Life Apart*, concluded that institutions using a "warehousing" ideology, were based on humanitarian values; and institutions using a "horticultural" approach were based on liberal values; but both provided a mechanism to avoid confrontation with the feelings of staff about the perceived inadequacies of the inmates. They suggest that the process of admission or discharge (intake or graduation in schools), places the recipient of services in a passive role. The staff regard the students, residents, or inmates as throughput, limits to be slotted into a flow diagram. Miller and Gwynne argue that a major shift is needed, in which the students become part of the human resources, which are focused on a work oriented throughput. Instead of focusing on helping students or clients to achieve their potential, values should be shifted toward outlining specific remedial or educational objectives. The student or client becomes an integral part of the process by which these objectives are achieved, not a passive recipient of services. Without these changes,

> membership of the institution prescribes the dominant role as physical dependency—which in the warehousing setting extends to complete psycho-physical dependency. This, on the one hand, preempts the possibility of conflict with other roles and, on the other, entails delegation to the institution of many of the decisions that the able-bodied adult would have to make for himself. The resulting pattern of behavior is not one that is likely to foster the development of a mature personality. (Miller & Gwynne, 1973, p. 160)

As Miller and Gwynne contend, if neither humanitarian nor liberal values are appropriate, then possibly programs for deaf students and their parents, should be replaced by alternatives developed by the families themselves and by the deaf community.

This confusion of values is a severe problem, further complicated by the process of selection of students for mainstreaming. Bunch (1977) outlines the development of a mainstreaming program in British Columbia as follows: "Neither the government nor its critics could suggest acceptable and useful methods of assessing which children were suitable candidates for mainstreaming and what degree of support an individual mainstreamed child required" (p. 11). In fact, the reliability of the tests described by Bunch is too low to permit their use in selecting individuals unless one is prepared to accept a very high number of false positives and false negatives. In particular, he discusses two of the instruments developed for making these selections in deaf education, the Transitional Instrument for Selection of Hearing Impaired Students for Integration (Rudy & Nace, 1973); and the Mainstreaming Placement Question/Check List (Nix, 1977). Bunch rightly criticizes the weighting and scoring of these tests, and comments on areas of assessment that are included.

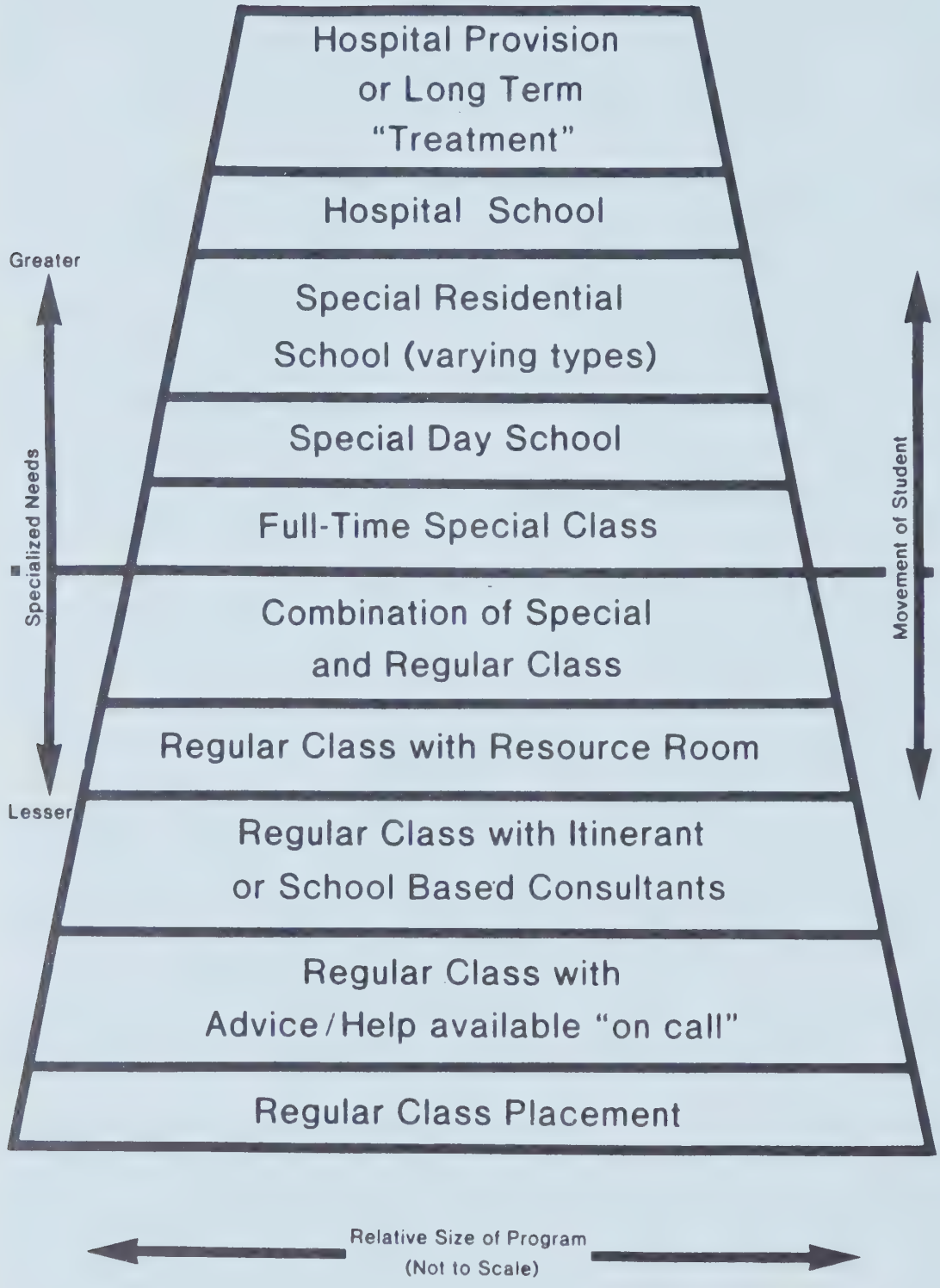

Figure 1: The Cascade System of Special Education (Modified from Deno, 1968)

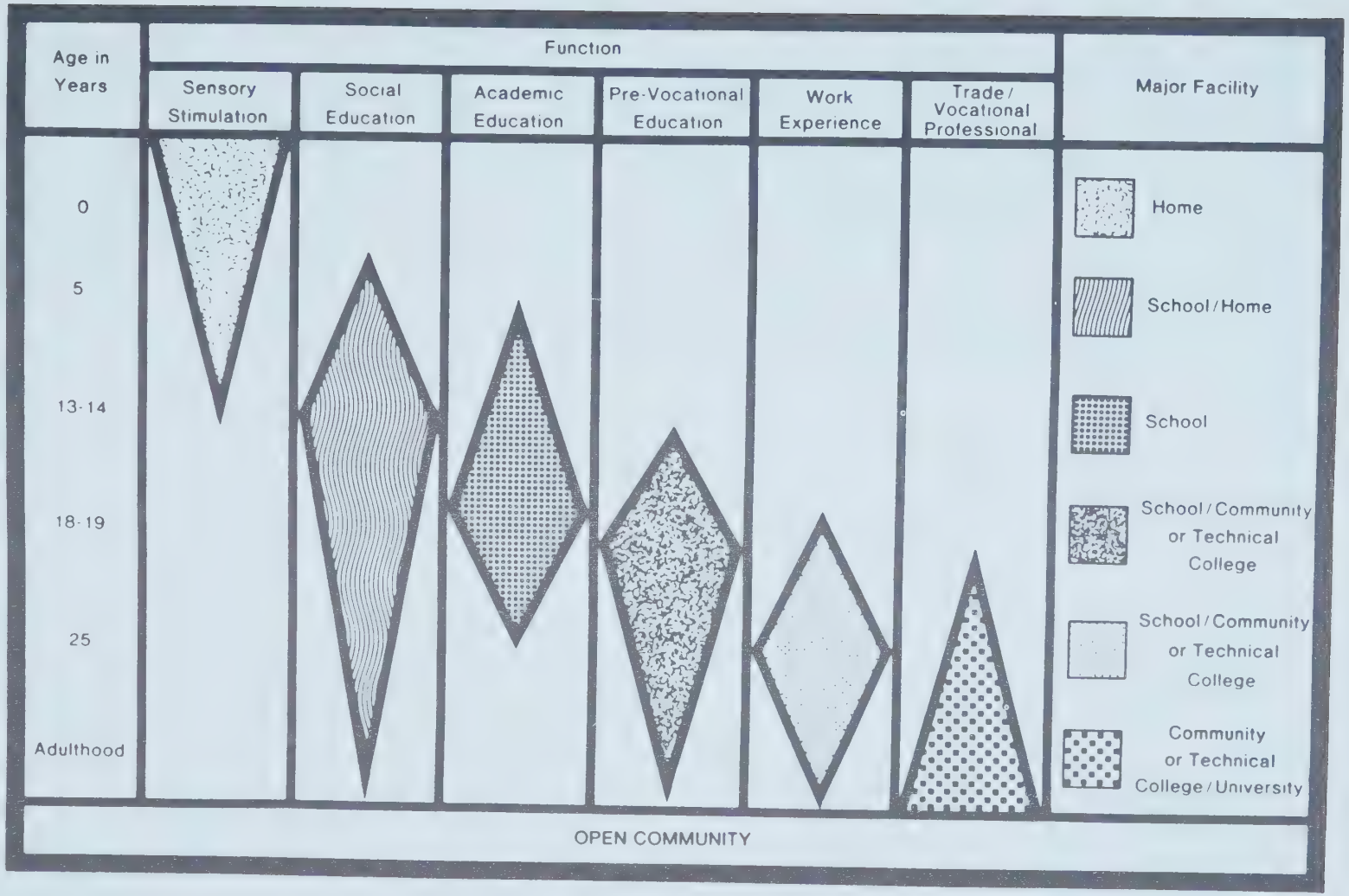

Figure 2: A social and educational program for deaf students (based on Gunzberg and Gunzberg, 1973)

There are also a number of concerns about the validity of the selection criteria used for placing students in mainstream programs, particularly as these criteria tend to reinforce existing biases within the educational system. Such reinforcement means that the student selected for mainstreaming will be the academically higher achieving student, with good language and communication skills, who is socially well integrated, of higher intelligence, and who is drawn from a supportive and intact home environment (Karchmer & Trybus, 1981). Hearing loss will be measured as much as any other factor (Ross, 1976), although unpublished research by Rodda, Grove, and Denmark question this finding when the sample is limited to severely prelingual deaf students. The effect of this selection process is to remove from the mainstream of deaf education the less educationally handicapped deaf child, and leave behind the more severely handicapped students. These students who could not or would not be "normalized" are considered "failures," which can be devastating to their self-concept (Carver, 1984). They are placed in special classes and lose contact with the good role models provided by successful deaf children. Their self-esteem is likely to diminish further (Greenberg & Doolittle, 1977), and indeed, although only approximately ten to fifteen percent of all deaf children can be successfully mainstreamed, schools for the deaf and special class placements are viewed as places for "mainstream failures," not as appropriate settings catering to the individual needs of many deaf students. The same view is shared by students in training as teachers (Curtis, 1985), who seem to be only "marginally committed to mainstreaming," and then only if they are supported by appropriate specialist staff.

In its anxiety to respond to a clearly articulated demand, the educational system has generally failed to adequately plan the whole spectrum of services and programs which are needed if mainstreaming is: (1) to be a successful facet of a total system; (2) is to retain and advance the support which students receive from group identity and role modeling in the deaf subculture; and (3) to enable integration to be a two-way process, hearing students and deaf students integrated with each other. If mainstreaming is to be successful, the mainstreamed student should be prepared and readied for the rigors of the regular classroom placement (Salend & Lutz 1984). "If the necessary classroom design adaptations that optimize student performance are not incorporated into the regular classroom milieu, the mainstreamed setting can be a highly restrictive environment for the handicapped student" (Salend, 1983 p. 56).

To rectify the defects described in the previous paragraphs will require a fundamental reassessment of the place of deaf culture and, in particular, of sign language in the curriculum of the regular school. "Mainstreaming would then place the child in the program which best met his communication needs." (Stewart, 1984, p. 102). In particular, deaf students placed in regular schools must have experiences that relate realistically to their needs, but mainstreaming as presently practiced, asks the student to adopt only oral communication methods, or limits his manual communication to interaction with only a very small and highly selected group of fellow students and staff. It asks the deaf child to accommodate to the hearing culture. Of course, all children, hearing or deaf, have to learn to accommodate to the wider society, but accommodation presupposes a similarity of social background and cultural experiences. Most hearing people and students do not have this empathy for and understanding of the deaf student, and rarely is it provided in the mainstream setting. The consequences of this lack of understanding and rapport are an increasing number of mainstream failures.

Bilingual Education

Charrow has undertaken two major studies of deaf students and the use of English as a foreign language (Charrow & Fletcher, 1974, Charrow, 1976). Using the Test of English as a Foreign Language, Charrow and Fletcher concluded English seemed to be processed as a second language by deaf students. In a later study, Charrow concluded that ASL did not interfere with language acquisition in deaf children, but rather their English reflected the particular difficulties faced by them in mastering oral language. Ivimey (1976) has similarly concluded that "deafisms" are systematic variations of English structure, for example, the use of adverbs or adverbial phrases to delineate time with a consequent failure to use verb tense for this purpose, and plurality is determined by subject determiners rather than by plural inflections. These examples indicate the influence of the spatial attributes of ASL on English, and reflect the difficulty the deaf child has acquiring rules based on phonetic characteristics, characteristics he/she is unable to hear or adequately process using vision.

In contrast to the bilingual environment of their home, Erting (1978) has described the situation which faces deaf children of deaf parents when they enter a school or classroom:

> Typically, these deaf children enter a monolingual classroom in which some variety of signed English is the only language used, and the only language manually presented that is understood by the teachers . . . The educational goal for these children is mastery of the signed English variety of PSE (Pidgin Signed English), and their communication is judged on the basis of the appropriateness of its grammatical form to English rather than on its content. From all this the message is clear: Their home, their family, their community, their language, and they themselves are not valued—they must change to become acceptable. (p. 143)

The situation for deaf children of hearing parents is no different in the classroom, but of course such children are in an even more difficult situation since they rarely have a well-developed language system in either English or ASL.

An interesting study of ASL/English bilingualism is that of Prinz and Prinz (1981, 1979). These authors studied a hearing female child, Anya, the offspring of a deaf mother and a hearing father. They noted that "babbling" occurred in sign language as well as spoken English, and the first sign emerged "several months before the first spoken words." Babbling in both languages was combined at an early stage of language development into oral or manual strings, which later associated with the development of combinations of oral and manual symbols to allow the child to communicate. The observations on the development of a lexical system showed, "lexical acquisition in ASL and spoken English progresses through similar stages," and the results of this study seemed to confirm (Volterra & Taeschner, 1978) that early bilingualism initially results in the formation of one lexical system into which entries are made separately from both languages. The study also confirmed the results of Stokes and Menyuk (1975). In the early bilingual acquisition of ASL and spoken English, a construct is encoded in one modality or the other, but only rarely in both modalities. Later this single lexicon separates; when this separation takes place, the use of alternate codes begins, and signs and words exist for the same concept. At this point, code switching becomes possible and is seen in the communicative behavior of the child. In the mainstream situation this code switching and the use of manual communication will be of no use to the child because of his/her placement in a monolingual setting—cognitive strategies and coping skills are rendered almost entirely useless, but we still persist in regarding unselective

mainstreaming as a viable alternative for all deaf children without taking into account their competence in English.

Role of Parents in Mainstreaming

Mainstreaming is an excellent example of the importance of parents as determinants of educational policy. In the USA, such demands culminated in PL 94-142 mandating the education of handicapped students in the "least restrictive environment." However, despite recent changes in educational policy, the paternalism of professionals towards parents still exists. Schlesinger & Meadow (1972) document this phenomenon, and Harris (1983) gives a highly personal account. The values parallel paternalism to deaf people and deaf children. Procedural protections which exist for parents can reinforce this attitude; often PL 94-142 is circumvented. As Garretson (1981) points out, the deaf child spends eight percent of his 8,760 hours per year in the classroom, but school systems have effectively insulated themselves from the full effects of PL 94-142 by defining appropriate as meaning "not inappropriate" (Large, 1980). This can lead to a situation where the provision by a school district of only one form of mainstreamed education is viewed as acceptable, and the parents of deaf children are forced to accept the local program, irrespective of its suitability for their child (Greenberg & Doolittle, 1977). Large (1980) crystalizes the dilemma: "Congress and the commentators have blithely assumed that regular placements were always more beneficial. Parents and teachers, who have to deal with the practical aspects of handicaps after the theoreticians finish congratulating themselves, are not so sure . . . Parents fear that their children will lose an effective education to be part of an ill-advised experiment in socialization," (p. 270) and "Research suggests that the success of the mainstreaming effort is often dependent on the quality of communication and support between these two previously distinct educational delivery systems" (Salend, 1984), the local school and the central campus or residential school.

In the education of deaf students, the issue of mainstreaming is complicated by the fact that a primary effect of the handicap is to interfere with the communication process between deaf and hearing people. In this sense, deafness differs from other handicapping conditions. It also differs as deaf culture is stronger and more established than other subcultures of handicapped groups, and there is considerable attachment to the subculture on the part of deaf adults. One effective way for a deaf student to obtain a positive self-image and to aspire to accepted values is through the support and role modeling which is available from deaf adults. This situation has long been recognized, yet Higgins (1980, p. 64) discusses the continuing and pervasive influence of authorities such as Alexander Graham Bell, and his considerable concern to prevent deaf people maintaining their subculture. Bell opposed residential schools, sign language, school reunions, adult deaf societies, and publication of the literature of the deaf community.

Given the attitude to deafness which characterized education in the past, and its replication in many areas of modern practice, it is not surprising that deaf people feel threatened by mainstreaming. Many social and political achievements of the deaf have come through a concerted and collective action on their part, not through the efforts of hearing society. The deaf community is an important and vital agent for changing the status of deaf people, and if destroyed, would probably regenerate naturally. Successful mainstreaming of deaf students needs the cooperation of deaf people. They are supportive of its general principles, but also

understand how difficult it can be to be "Outsiders in a Hearing World" or to be enclosed in a "Plate Glass Prison." Extreme neo-oralism and mainstreaming can be, and often are, the ultimate rejection of deaf experience, culture, and language, and, therefore, of deaf students and adults themselves.

Future Policy and Final Conclusions

Anderson (1973) offers some prescriptions for future policy on mainstreaming. Her study of physically handicapped children receiving education in ordinary primary schools in England was exceptionally searching and she concludes that "given special provisions . . . it is possible to offer even severely handicapped children a satisfactory education in an ordinary school." She considers, however, that "for certain children special schools may always be needed, but as the provision of special educational treatment within ordinary schools increases, this need is likely to be smaller than at present." She suggests three main functions for the special schools:

> The first is that they should be used increasingly as observation and assessment centres. Secondly they should provide children (from as early an age as possible) with an initial period of skilled and intensive training by teachers and therapists working together. . . . After this training period, which might for some children last from one to four years, many children would be ready for transfer to a special or ordinary class. Ideally the special school would be sited close to an ordinary school so that for at least part of the time handicapped and non-handicapped children could be taught in mixed groups. Thirdly, special schools could act as advisory centres from which . . . experienced teachers and therapists could travel as consultants to teachers in special and ordinary classes who need help. (p. 302)

At present, the large majority of hearing impaired children "track" for the whole of their school careers in one type of setting, unless they fail to integrate in adolescence, in which case they often transfer to a residential or day special school. Movement between different settings can often be difficult or impossible, but as students' needs change, a formerly appropriate environment may become inappropriate. Consequently, integration will not occur simply because of proximity, and to ignore the problems of the handicapped child in coping with his/her handicap is to ignore all we have learned about attitudes and the need to change community values if positive attitudes are to be developed. Deaf students can have a special advantage over other handicapped groups, the support of and membership in the deaf community. By failing to accept the experience of the deaf community, present mainstreaming practices are doing little, if anything, to remedy the real deficiencies in the education of deaf students. Such students are leaving schools with very poor skills in basic competencies, and there is an epidemic of emotional/behavioral problems in the school-age deaf population (Schein, 1981). In advancing an uncritical commitment to mainstreaming, we are proffering an administrative solution with no real base in clinical practice or educational services, and a solution with little potential for solving the major problems confronting our educational sytem.

Note

1. This article grew out of Dr. Rodda's activities as a McCalla Research Professor in 1983-84.

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PERSPECTIVES

Applications of New Directions in Statistics to Educational Research

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Some recent developments in applied statistics are described and examples of their uses given. The data used in the examples were taken from a study involving classroom interactions in fourth grade mathematics classes. The utility of stem and leaf displays, box and whisker displays and transformations is illustrated. Two developments in inferential statistics, the bootstrap technique and randomization tests are presented. The first is a strategy for developing confidence intervals in situations commonly encountered in education, that is, where no random selection has occurred but statistical generalization is desired. The second is useful for testing the hypothesis that data show trends that are plausibly random.

The use of statistics in educational research has a history that covers more than 50 years. Improvements over that time have usually been in the direction of increased complexity and mathematical sophistication. Many have been made possible through the development of the digital computer. Recently some new developments in statistics have occurred which are beginning to attract the attention of social science researchers. Unlike previous trends these developments are characterized by increased simplicity and direct involvement of the researcher with data.

The principal purpose of the present paper is to describe some recent developments in applied statistics and to illustrate their use with data collected in an educational setting. Prior to doing this, it is useful to review the current orthodoxy—and then to suggest in general how the recent work differs from the traditional in terms of philosophy and approach.

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Background

Conventionally, statistical analysis has been treated in the texts as a prescribed, often *monolithic* activity. Proposers of research are encouraged to specify in advance the statistical procedures to be used, and deviations from these, especially deviations that occur as a result of seeing the data as they accumulate, are often referred to as data snooping and are usually discouraged.

Analyses are seen to be divisible into two parts: description (presentation and summarization) and inference (hypothesis testing and confidence interval construction). There is a tendency in most texts to concentrate on the form of the analysis at the expense of the purpose of the analysis in the context of the entire research enterprise. For example, data presentation is often covered by bar graphs, histograms, and frequency polygons, but seldom is any attention given to why a researcher should use one or other of these procedures, and what would result from the examination of data presented in these ways.

In 1977, Tukey's *Exploratory Data Analysis* appeared. It was a compilation of many ideas that he and others had developed and it represents a change in the way in which we look at data analysis. The thrust of the book is that statistical analysis ought to be a creative, reflective activity that contributes both to discovery and confirmation. To do so requires approaches that encourage the researcher to adjust the analytical strategy to fit the circumstances of the research. In addition researchers are exhorted to make extensive use of their data, and far from being discouraged, data snooping is seen as a valued activity.

According to Tukey and others the field of applied statistics relates to three functions of research: exploring, justifying, and archiving. Data exploration involves the interaction between the research and the results. As Good (1983) points out, the techniques of data exploration should be designed to fit the salient features of the data to human cognition. Since patterns are important, data exploration should emphasize graphical analysis and de-emphasize formulas and numbers. There should be a concern with exceptions, since they often stimulate theoretical development. Concentration on summaries should not be made at the expense of interesting exceptions. Justification usually involves a process of informed debate (e.g., researcher-reviewer). Consequently clarity of presentation, estimation of uncertainty, accuracy of calculation, and consideration of alternative explanations are important characteristics of analytical strategies. Placing data in archives for future use by other researchers requires attention to efficiency of storage, simplicity of deposit, and ease of retrieval.

In the remainder of the paper, applications of recent developments from the two broad areas of statistics are presented. From descriptive statistics some examples of exploratory data analysis are provided. Edgington's randomization test (1980) and Efron's bootstrap technique (1982) are two examples of recent work in inferential statistics. The data used in all examples were collected by Macdonald (1972).

As a part of his doctoral research, Macdonald observed pupil teacher interaction behaviors in seven fourth grade mathematic classes. The Flanders interaction analysis categories (1970) were used for this purpose, and the six categories of behavior used in this paper are shown in Display 1. Each class was observed for 20 hours, and teacher behaviors were noted together with the student to whom they were directed. Approximately 70% of the interaction could be described as occurring between teachers and individual students, and it is this dyadic behavior

that is used in the analyses. Data for students who missed more than five classes were dropped. The results were prorated for students who missed fewer than five classes.

Data Exploration

In most studies of this sort the first step in the analysis would be to summarize the data by calculating means and standard deviations. These are shown in Display 2, as they would be found in the print-out of a typical computer program. The large number of decimal places that have been retained makes it difficult to see interesting trends. Perhaps a better way to examine the data would be to approach summarization in smaller steps and begin by simply organizing the data in a systematic fashion. One procedure that can be easily done either by hand or machine is the stem and leaf display. In Displays 3 and 4, stem and leaf displays of variables for Classes 6 and 7 are shown.

Display 1
Flanders Categories Used in Macdonald's Study

Teacher Talk

1. **Praises or encourages**. Praises or encourages pupil action or behavior. Jokes that release the tension but not at the expense of another individual; nodding head or saying "um hm" or "go on" are included.
2. **Asks questions**. Asking a question about content or procedure, based on teacher ideas, with the intent that a pupil will answer.
3. **Lectures or explains**. Gives facts or opinions about content or procedures; expressing his own ideas, giving his own explanation, or citing an authority other than a pupil.
4. **Criticizes or justifies authority**. Statements intended to change pupil behavior from a non-acceptable to an acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self reference.

Pupil talk

1. **Pupil response**. Talk by pupils in response to teacher. Teacher initiates the contact or solicits pupil statement or structures the situation. Freedom to express own ideas is limited.
2. **Pupil initiation**. Talk by pupils which they initiate. Expressing own ideas; initiating a new topic; freedom to develop opinions and a line of thought, like asking thoughtful questions; going beyond the existing structure.

A stem and leaf display is a way of tabulating data that combines the visual characteristics of a histogram with the ability to recapture each of the data values. The stem is the value that appears to the left of the colon, the leaves appear to the right. To recapture an original value you simply attach the leaves to the stem. For

Display 2
Means and Standard Deviations of
Interaction Variables in 7 Classes

	MEANS					
Class	1	2	3	4	5	6
1	9.2727	58.1818	14.3636	9.5455	75.5455	27.0909
2	12.5909	46.7727	61.7727	7.8636	38.1364	19.2273
3	16.0385	47.0385	29.9231	3.9615	45.5769	28.3077
4	12.7826	42.6957	35.0870	14.0870	71.8261	44.3478
5	10.8571	39.4643	13.1786	6.2143	42.8571	32.7143
6	4.6429	27.0000	16.9643	4.2143	18.0000	27.1429
7	11.8571	62.6786	25.5000	10.75.0000	78.0000	25.6429
	SDEVS					
Class	1	2	3	4	5	6
1	5.7618	25.8345	10.8357	9.6471	22.2929	15.6812
2	4.1193	23.8116	37.9736	7.7887	22.9749	15.3769
3	10.4236	42.6294	26.7336	4.4070	38.2111	21.8505
4	3.9668	24.8394	24.2503	12.2932	31.9233	35.3413
5	6.5776	23.5653	15.5404	5.8393	27.0776	18.7880
6	2.9425	10.1242	9.7266	4.8724	8.0401	18.3978
7	4.3566	35.6431	16.5497	13.1084	32.7850	18.1348

Variable 1 Teacher Praise
Variable 2 Teacher Questions
Variable 3 Teacher Explains
Variable 4 Teacher Criticizes
Variable 5 Pupil Response
Variable 6 Pupil Initiation

example, looking at Display 3, teacher questions, Class 6, the first row is 1: 01457799. This means that one student was asked 10 questions, one was asked 11, and so forth. The original data for this row were 10, 11, 14, 15, 17, 17, 19, 19. In Display 4, for the variables praise and criticize, there are two rows for each stem. Leaves from 0 to 4 are in the first row and leaves from 5 to 9 are in the second. For comparing the two classes, this tends to spread the scores out a bit and highlights the differences in the distributions for these variables more clearly. Of course it does make it more difficult to compare the distribution of Praise with that of Explains. Portrayals almost always involve judgment, and more than one portrayal may be needed to bring out the important characteristics of the distribution.

As noted earlier, the purpose of the analysis is not to build pictures; rather it is to aid in understanding the data. In Displays 3 and 4 there are many things to notice but the restrictions of space in the present paper limit the discussion to two points. First, the stem and leaf displays show a large variation existing both between and within classes. Researchers often talk about a fourth grade mathematics class as though it were a coherent, unitary entity. Stem and leaf displays quickly demonstrate that this simply is not so. For most of the variables, Class 6 exhibits much less interaction than Class 7. In particular, the number of questions asked in Class 6 ranges from a low of 10 to a high of 50. The median value is about 25. In Class 7 the range is from 13 to 205 with a median of 54. The second teacher not only asks many more questions than the first teacher, but the distribution of ques-

tions to various students is much less consistent. It seems clear that the class environments must be very different.

A second thing to note is that often data like these (counts, times, etc.) have distributions that are peculiar. The fact that they are bounded on one end by an absolute zero seems to encourage a trailing off or skewing toward the other. In Class 7, one person is asked 205 questions in 20 hours. Such abnormal points can be a profound influence on summary statistics, and unless the distribution is examined, the problem may go unnoticed. For the example, the correlation over the 28 students between teacher quetions and teacher explanations is .71. If you exclude the person who was asked 205 questions, the correlation drops to .51.

Having organized the data into stem and leaf displays, and having made note of the shapes of the distribution, the researcher will likely need to pause and reflect on the possible reasons why different shapes emerge. Some distributions have distinct lumps; others have a uniform spread of values across the range. In each stituation, the purpose of the data portrayal is to stimulate questions in the researcher's mind. Some questions may be answered by further analysis while others may lead to further research.

The stem and leaf display retains all of the information in the original data except for the identity of the individuals. After the data have been examined, it is usually useful to proceed to some sort of summary. Means and standard deviations are attractive when they have one mode and are reasonably symmetric. They give the reader a sense of central tendency and of spread. An alternative approach that accomplishes the same thing visually is the box and whisker display. Examples for Class 7 are shown in Display 5.

The ends of the boxes are placed at the first and third quartiles. The line through the middle of the box is the median. The whiskers join the boxes to the extreme scores, except in cases where the extreme scores fall more than one and a half box lengths beyond the upper or lower quartile. Such scores are marked with asterisks and are called outliers. Students whose scores fall at the extremes have been labeled. For example, pupil 19 is asked the most questions, makes the most responses, and receives more explanations than any other student.

If the data have been organized into stem and leaf displays, the construction of a box and whisker display is a simple matter requiring the researcher to count in to the quartiles and the median. When distributions are highly skewed, medians and interquartile ranges are usually more useful indices of central tendency and dispersion than means and standard deviations. Whether working by hand or with a computer they are easy to calculate. The box and whisker display essentially uses five numbers to summarize the data: lowest value, first quartile, median, third quartile, and highest value. Generally speaking the visual representation of these five summary values gives the researcher more insight than tabulating the two summary values (mean and standard deviation) such as is done in Display 2.

Class 7 is characterized by a lot of questioning and answering. These medians are much higher than those of the other variables. There is very little praise and criticism, and few children initiate interactions. Having said this, it is important to note that the class experience is different for different students. For example, pupil 19 is in action far more than other children. One wonders what happens on the days that pupil 19 stays at home? What is the effect on the teacher's strategies of having a child like this in class? Perhaps something significant could be learned about teaching and learning if a case study were conducted in the interaction between this pupil and teacher.

Display 3
Steam and Leaf Displays
for Teacher Questioning and Student Responding
(Stem: tens
Leaves:units)

TEACHER QUESTIONS

CLASS 6	CLASS 7
1 : 01457799	1 : 3
2 : 11124569	2 : 9
3 : 123355788	3 : 78
4 : 12	4 : 012444466
5 : 0	5 : 346
	6 : 012
	7 : 056
	8 : 048
	9 : 9
	10 :
	11 :
	12 : 4
	13 :
	14 :
	15 :
	16 :
	17 :
	18 :
	19 :
	20 : 5

STUDENT RESPONSES

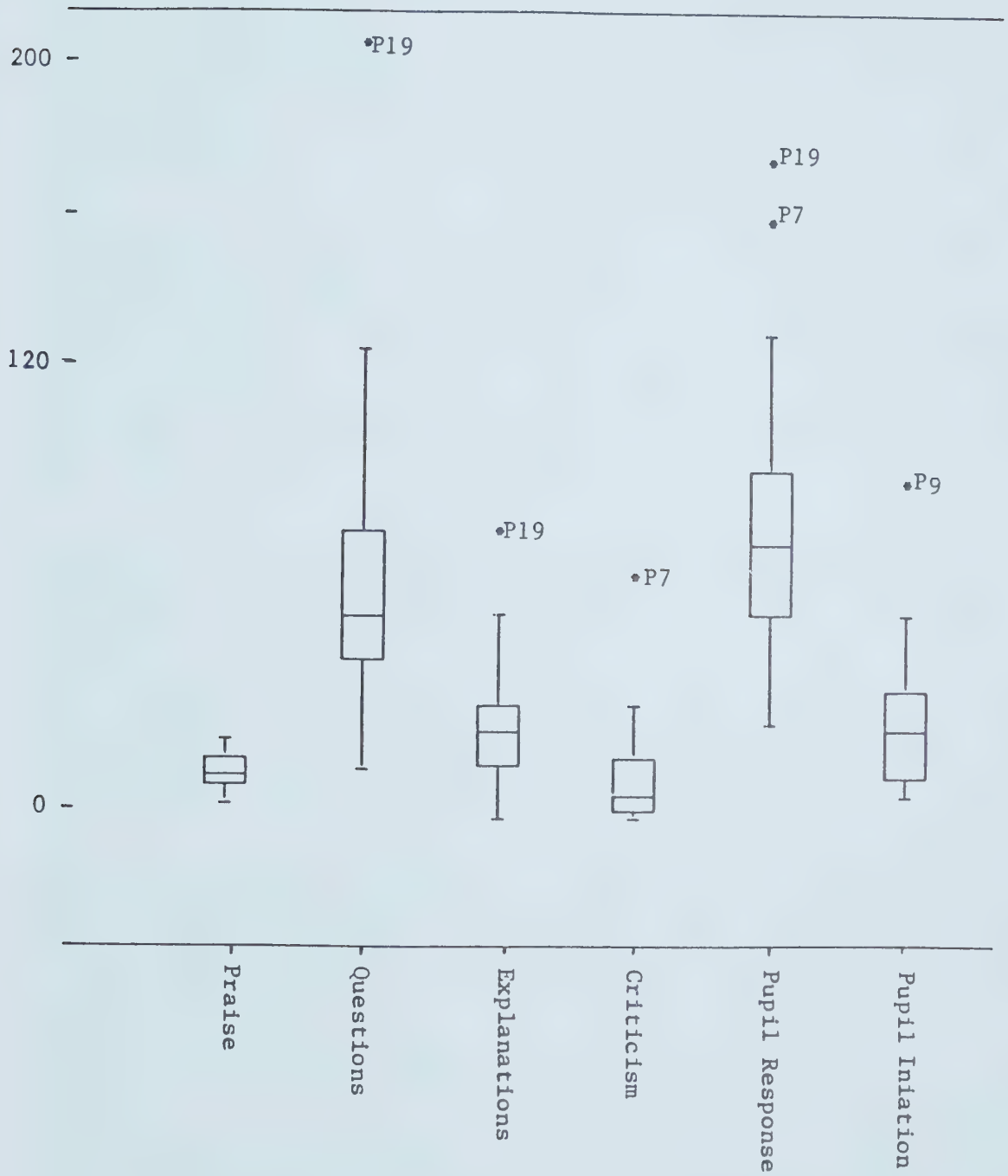
0 : 24578	0:
1 : 12445677779	1 :
2 : 11156677799	2 : 5
3: 0	3: 8
	4 : 279
	5 : 346
	6 : 04478
	7: 1488
	8: 489
	9: 0256
	10 : 2
	11 :
	12 : 8
	13 :
	14 :
	15 : 8
	16 :
	17 : 4

Display 4
Stem and Leaf Displays
for Four Interaction Variables
(Stem: tens
Leaves:units)

PRAISE		EXPLAINS	
CLASS 6	CLASS 7		
0:0111122222444	0:4	0:445669	0:0189
0:555556677779	0:56788999	1:122222444679	1:3445788
1:000	1:0011112223333	2:122445	2:01335667
1:	1:66679	3:135	3:0001
2:	2:11	4:2	4:48
			5:34
			6:
			7:6

CRITICIZES		PUPIL INTERACTION	
0:00001111111122234	0:001122234	0:44679	0:66688
0:55666779	0:5556666788	1:0124789	1:0113569
1:04	1:03	2:4559	2:2344779
1:	1:69	3:001345	3:0045
2:	2:34	4:126	4:668
	2:5	5:	5:4
	3:0	6:47	6:
	3:	7:	7:
	4:		8:7
	4:		
	5:		
	5:		
	6:4		

Display 5
Box and Whisker Display of Class 7 Interactions



Procedures such as stem and leaf displays and box and whisker displays help researchers to see some of the most important features of the data such as the general level of the scores, the spread of the scores, and exceptional values. Sometimes there are interesting points that are not shown by these portrayals, and data transformations can be used to bring them out.

Data transformation is a topic that receives little play in the methodological literature, and even less play in research reports. Generally transformations are mentioned in two contexts: linear transformations to standardize scores, and nonlinear transformations to satisfy assumptions required by inferential statistics. There are two other reasons for transforming data that are just as important. They are transformation to match our conceptualization of a variable, and transformation to accentuate regions of a score distribution. In data exploration, transformations are often used for one of the latter reasons.

In examining Macdonald's (1972) data, some researchers may decide that the incremental effect of teacher behavior on students acts in proportion to the amount of interaction that has already occurred. For example, if there are two students and one is asked 200 questions in 20 hours and the other one is asked 20 questions in 20 hours, an increase of five questions would likely have far less influence on the first student than on the second. It may seem reasonable that a 25% increase has the same impact so that five questions for one student is equivalent to 50 for the other. If this is so, then an equal interval scale of influence would be the log of the frequencies rather than raw frequencies. This would be an example of transforming data to match a reconceptualization of the variable.

The other reason for transforming data is to accentuate parts of the distribution that do not show up very well. As noted earlier when the data are composed of counts they are often skewed. Plotting techniques usually draw attention to the upper outliers. If we transform the data to make the distribution more symmetric, then the eye is not drawn to the upper end at the expense of the lower end.

To illustrate, a log transformation was placed on the data from Class 7. The results for each variable were then standardized by subtracting the median and dividing by the interquartile range. This made it possible to compare variables. A box and whisker display is shown in Display 6.

In examining Display 6, the reader should realize that two transformations have been carried out. First, the data were transformed to logs which meant that proportionate differences were made into equal intervals. Secondly, the logged data were transformed so that the interquartile ranges for each of the variables were made equal. The second transformation was done so that the exceptional scores would have an equivalent impact. For example, the second lowest score on explanations (P20) is twice as far below the median in interquartile units as the lowest on praise is from its median (P5).

Regardless of the units however, the log transformation brings to the reader's attention pupil 20. In some respects this child is as exceptional as pupil 19, except that neither the researcher nor the teacher would likely have spotted it. Again a case study of this exceptional student might tell us much about what happens in classrooms.

There are many other exploratory strategies that can be used to examine data, and the interested reader will find Tukey (1977) an excellent starting point.

Bootstrap Confidence Intervals and Randomization Tests as Approaches to Statistical Inference

Broadly speaking, statistical inference strategies fall into two categories: hypothesis testing and confidence interval construction. In many cases it is possible to move back and forth between the two in a mathematical sense, but there is a conceptual distinction. Hypothesis testing requires the specification of a point hypothesis which is the focus of a decision. Usually in the behavioral sciences we aim to reject the hypothesis in order to support our theories. Thus hypothesis testing is logically tied to theory construction. When a researcher constructs confidence intervals, the goal is to estimate some characteristics of a population from information collected on a sample. There need be no theory involved at all.

Campbell and Stanley (1963) distinguished between the internal validity of studies and the external validity. Roughly speaking internal validity refers to the ability to attribute reasons or causes to particular outcomes. External validity refers to the ability to generalize results to other groups and other circumstances. Bracht and Glass (1968) examined the notion of external validity and broke it down into population validity—the ability to generalize results to other people or samples, and ecological validity—the ability to generalize results to other circumstances. Inferential statistics is seen by many writers (including Bracht & Glass) as working in the service of population validity. The methods of statistical inference allow us to make statements about populations based on observations made on samples.

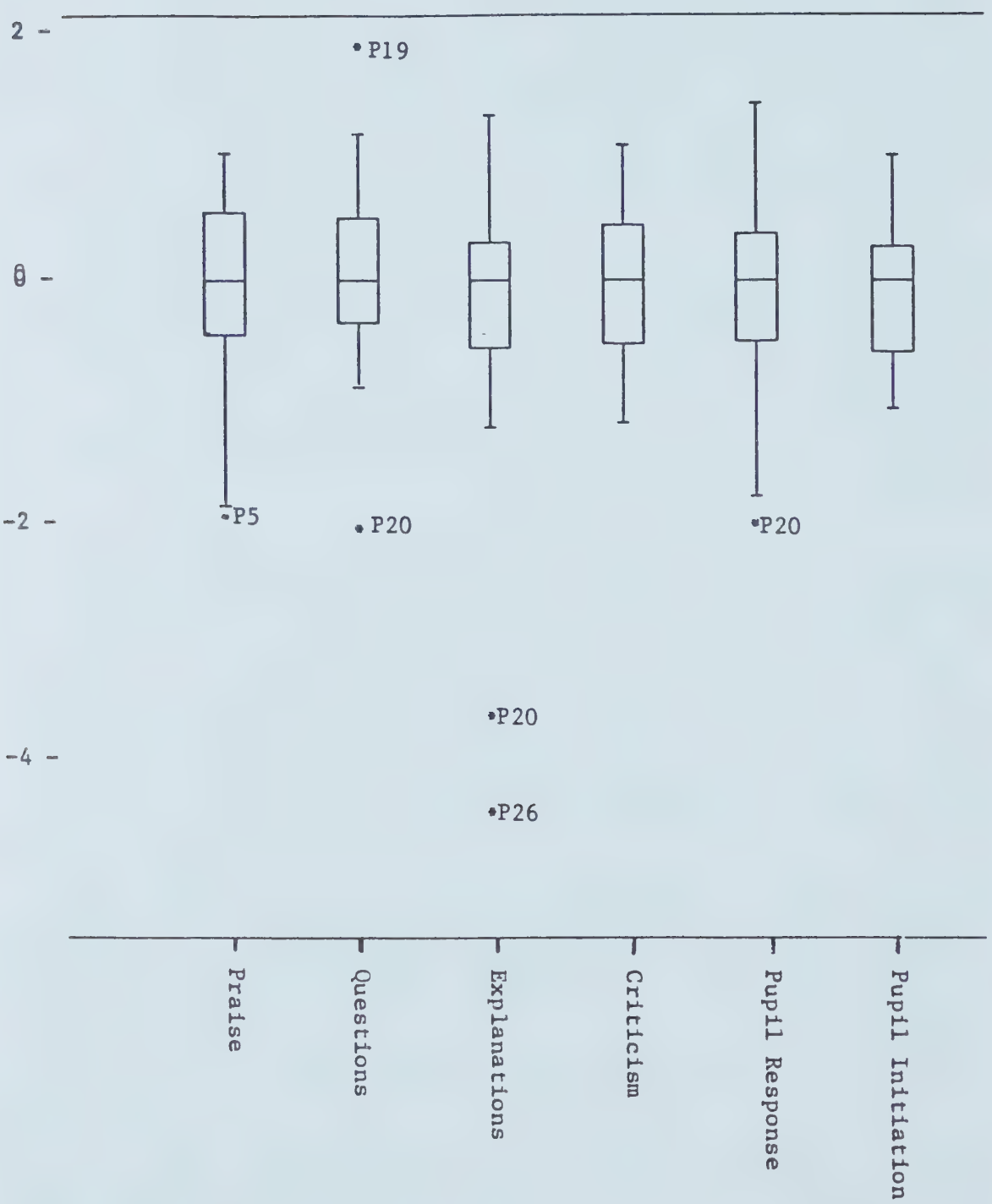
In many of our statistics courses we fail to put inference in its proper perspective. Students have difficulty grasping the logic, and there is a tendency to accept inferential models uncritically. This leads them to behave as though population validity were entirely a statistical issue.

Inference is *essentially* a process of reasoning and debate. The scholarly community examines the quality of arguments, and knowledge emerges through a process of critical analysis of evidence and implication. Statistical inference has no special status, but it does have particular power to convince when the circumstances of the study are working favorably. Unfortunately, models for statistical inference reflect the affairs only approximately. The principal operating assumption that helps us to go beyond the data is that there is a random sample from some population. Given this, a little logic, some algebra, and a good salting of the calculus of probability, the inductive leap is made. In practice, the random selection assumption is almost never met in educational research. Our samples are usually an available or interesting group who have either given their consent to be studied, or had it given for them.

Even knowing this, there is something about the consistency of human behavior that suggests that the findings from one sample extend beyond the boundaries of the study. Extensions are rationalized by saying that the observed data behave as though they were a random sample from some hypothetical population. In other words, samples represent something beyond themselves, and so tests are performed, or confidence intervals calculated in the hope that they will give us some idea of the uncertainty of the findings.

Since in most educational research the sample studied is unlikely to be a ran-

Display 6
Class 7 Standardized Log Frequencies



dom sample of any population, the aim should be to find samples that *represent* populations of interest. They should be well described, and the internal variation should cover the most interesting uncertainties in the population. How much an interpretation is trusted will depend as much on knowledge of the context (i.e., knowledge of the entire area being examined) as on the probability of type 1 error.

Efron's (1982) bootstrap technique provides a partial answer to the problem of nonrandom samples. It can be used to describe the uncertainty that arises in educational studies. The notion is simple—create a hypothetical population that is an infinite number of replications of the sample that you have, then draw random samples of individuals from the hypothetical population and create an empirical sampling distribution of the statistic of interest. The empirical random sampling distribution gives us an idea of the kind of sample variation that we might expect from a population of which our sample is perfectly representative. It gives a conservative estimate of the amount of sample "wobble" in the data.

Macdonald's data can be used to show how the bootstrap works. In Display 7, the median values for each of the classes on the six variables are shown together with the correlations which were calculated over medians between pairs of variables. Medians have been used to represent the activity in each class because they are insensitive to outlying values, and in many of the classes there were one or two exceptional scores that could have influenced a less robust statistic. Correlations between -.4 and +.4 have been excluded, and the variables have been clustered to make reading easier.

Since the correlations have been calculated on class medians, they are an indication of the relationships that exist among the general level of the variables over classes. For example the correlation of –.6 between explanations and pupil initiation suggests that classes that have relatively high amounts of pupil initiation tend to have relatively low amounts of teacher explanation. Three overlapping clusters of variables emerge from the table: questions, responses, and criticism; criticism, praise, and explanation; and explanation and pupil initiation. While the correlations are based on only 7 classes, there is a sense that they should be fairly robust since 7 medians ought to have less uncertainty than 7 individual student scores would have. The bootstrap can be used to estimate the uncertainty.

To see how the bootstrap works, consider teacher explanations and pupil initiations. The medians for seven classes have been plotted and around each class a cloud of points has been drawn. This is the hypothetical population which is perfectly represented by our sample. In other words, a hypothetical population is conceptualized which has an infinite number of members exactly like the medians of Class 1, an infinite number of members exactly like the medians of Class 2, and so forth. The population would look like Display 8. It is a population that Macdonald's sample exactly represents. To produce an empirical sampling distribution, 7 classes are now drawn at random from the hypothetical population. Practically speaking this is done by randomly taking 7 points *with replacement* from the set of 7 paired values that relate teacher explanations to pupil initiation. This process could yield three sample values exactly like Class 1, one like Class 3, one like 5, and two that look like 6. The correlation between the teacher explanation and pupil initiation in this bootstrap sample is –.68.

This procedure is repeated many times and each time a correlation is calculated. In this example 1000 replications were carried out. Macdonald's 7 classes is one sample from the hypothetical population shown in Display 8. The correlation

in the "population" between explanation and initiation is -.6. just as it is in Macdonald's sample. The distribution of 1000 sample correlations is shown in Display 9.

Ninety-five percent of the observed values fall between -1.00 and .85. This is a very wide interval indeed, and it tells the researcher that Macdonald's sample of 7 medians contains a fair amount of sampling uncertainty. Indeed, with these data, a researcher cannot even be sure that the sign of the relationship would replicate in a future study carried out with a similar population.

The shape of the distribution is very interesting. There are two parts: one in the vicinity of –.6 and the other around +.6. This is another example of the sensitivity that correlations have to odd points in the data. In Display 8, Classes 7, 3, 6, 1, and 5 fall on a line that drops to the right. If these are the only classes in a bootstrap sample, then the correlation will be about -.87. If Class 2 is included in the bootstrap sample, the correlation jumps to about –.99. Taking out Class 2 and putting in Class 4 changes the correlation to about +.49. The positive bootstrap values come from samples that exclude Class 2 and include Class 4, while the negative values near –.1 include Class 2 and exclude Class 4.

This particular example is noteworthy because not only does it illustrate the procedure, but it suggests that an inferential technique can be used in data exploration. In this case we are reminded that the classes are not "well behaved." Even when going to median scores, we see that the notion of a "typical grade 4 math class," is strained.

Usually statistical inference is thought of as being a servant of external validity, and most parametric tests are used in this role. In non parametric statistics the hypotheses being tested are often related to issues of internal validity and in that way are qualitatively different from those tested by parametric strategies. Edgington (1980) and many others point out that exact tests can, in principle, be calculated to test the hypothesis that a particular partitioning of scores differs from that expected under random allocation. For example, 10 people could be randomly assigned to each of two groups, a treatment carried out on one of the groups, and a post treatment test administered. The post test yields a particular

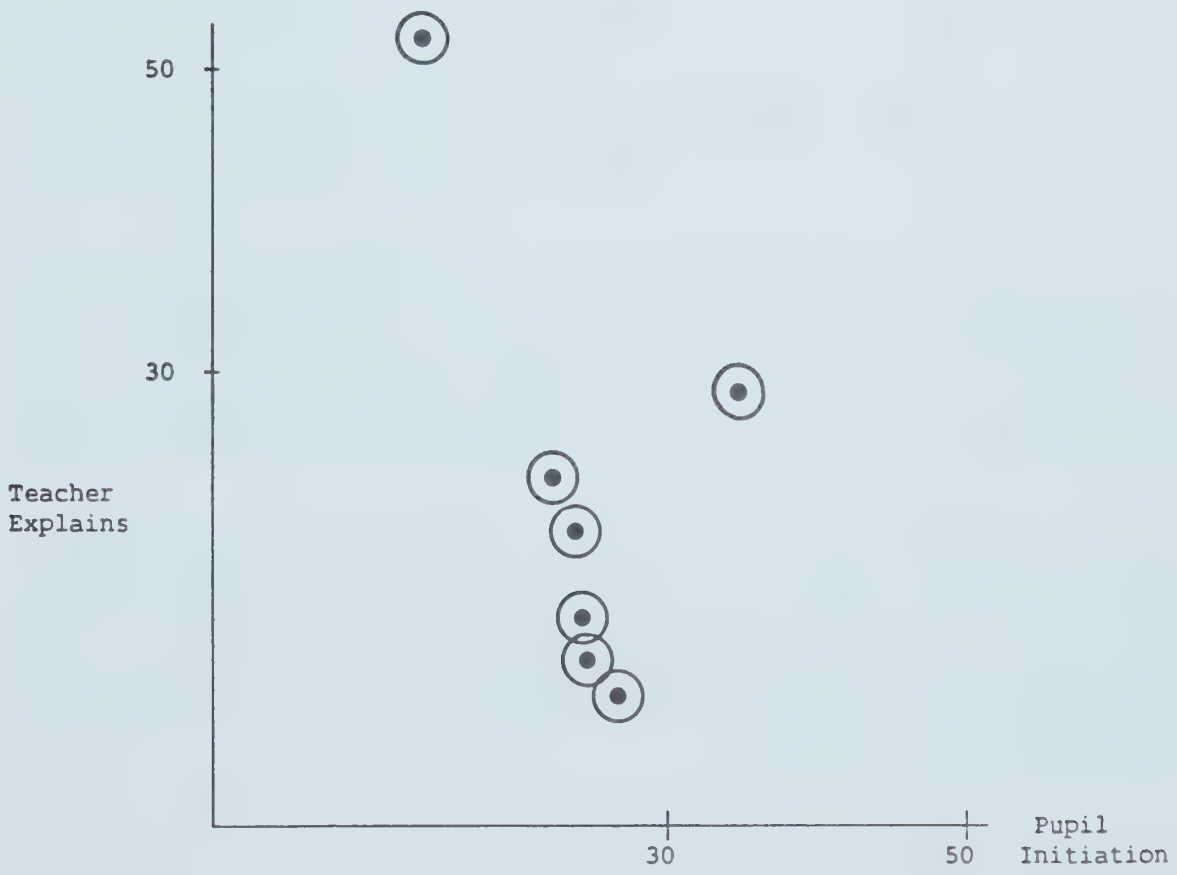
Display 7
Class Medians

Class	Praise	Asks Questions	Explains	Criticizes	Pupil Response	Pupil Initiation
1	9.5	55.5	11	6.5	74	25
2	13	42	52	6	30	14
3	12.5	28.5	18.5	2	30.5	24.5
4	12	35	28	10	62	35
5	10	34.5	8.5	4	37.5	27.5
6	5	25.5	14	2	17	25
7	11.5	53.5	23	6	72.5	23.5

Display 7 continued
Correlations of Class Medians

ASKS QUESTIONS	1.0	.8	.5			
STUDENT RESPONSE	.8	1.0	.7			
CRITICISM	.5	.7	1.0	.4	.4	
PRAISE			.4	1.0	.6	
EXPLAINS			.4	.6	1.0	-.6
PUPIL INITIATION					-.6	1.0

Display 8
Hypothetical Population



partitioning of the scores between the two groups. Using the difference between the means to represent the treatment effect, the exact sampling distribution could be calculated under the null hypothesis that the observed statistic is merely the result of a random partitioning of the 10 scores. In ordinary languge this is evidence relative to the question, "Did a treatment effect occur?" or, synonymously "Is the observed partition substantially unlike that which we would expect through chance allocation of people to groups?"

This is conceptually different from the logic inherent in the t-test (or the confidence interval), wherein the researcher asks if the observed difference is so big that we can reject the null hypothesis of no treatment effect in the population. In the former case, the notion of a random sample need not enter the picture. The inference is not made about a population of people; it is made about a population of possible events.

Edgington showed that instead of enumerating the chosen statistic for all possible partitions, the researcher could evaluate the observed statistic against a large sample of values calculated from randomly generated partitions based on a true null hypothesis. Even in the case where there is no random assignment of people to groups, the randomization test can be used to evaluate an observed difference against a model of random allocation.

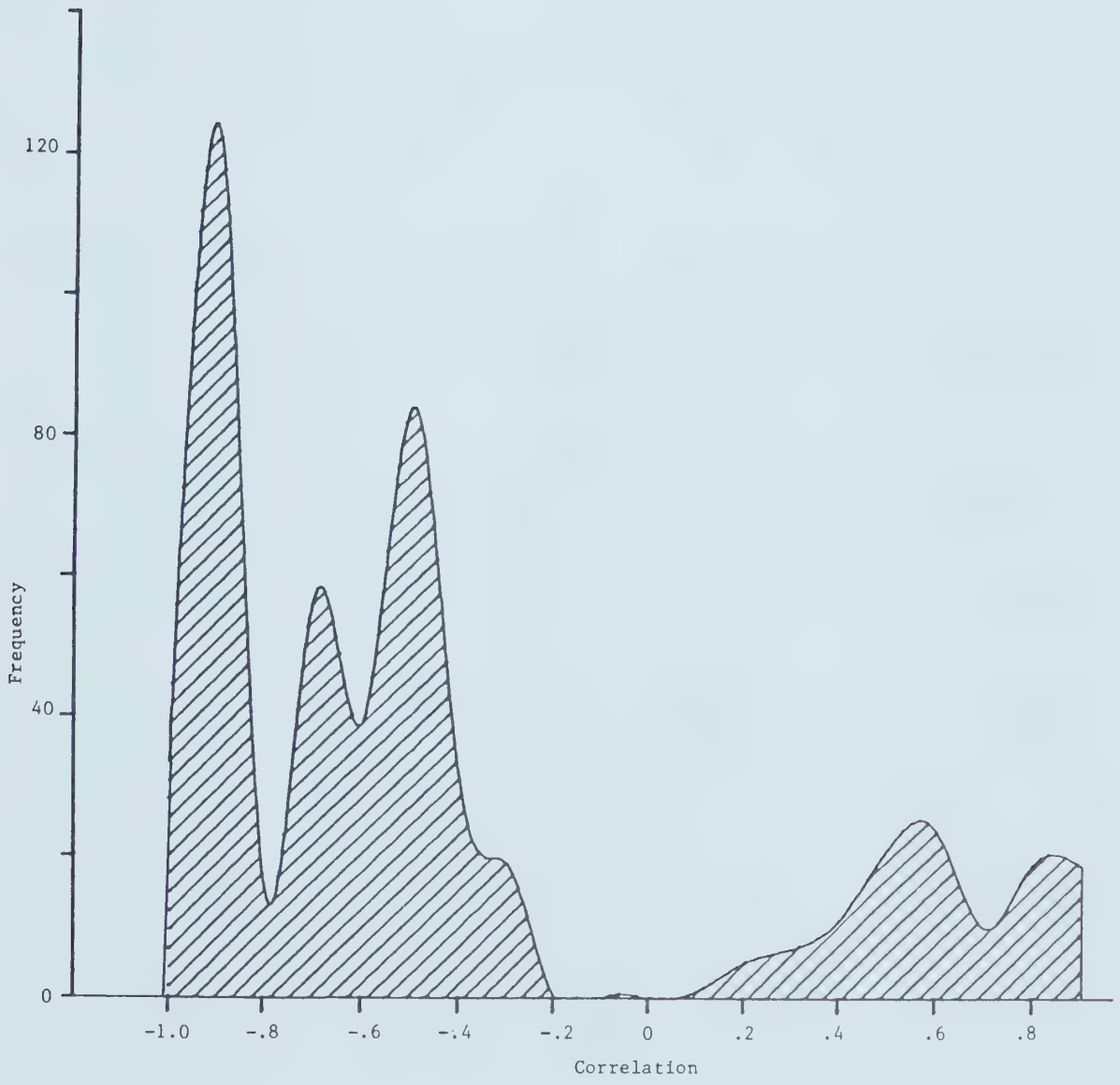
Suppose that we were interested in the amount of pupil responding in Classes 6 and 7. We can see at a glance that there is more responding in Class 7 than in Class 6, but is the difference in *variability* unusual? Or put another way, is the difference significantly greater than what we would expect from a random allocation of scores to the two groups?

One measure of variability is the interquartile range. For Class 7 this value is 36, and for Class 6 it is 13. The difference is 23. Each of the classes has 28 children. A sense of the importance of this difference between interquartile ranges can be obtained by using some of Edgington's ideas. Disregarding class membership, the 56 scores are randomly assigned to two sets, the interquartile ranges from the two sets calculated and the resulting difference recorded. This process is repeated many times and the distribution of differences produced. The result for 500 replications is shown in Display 10.

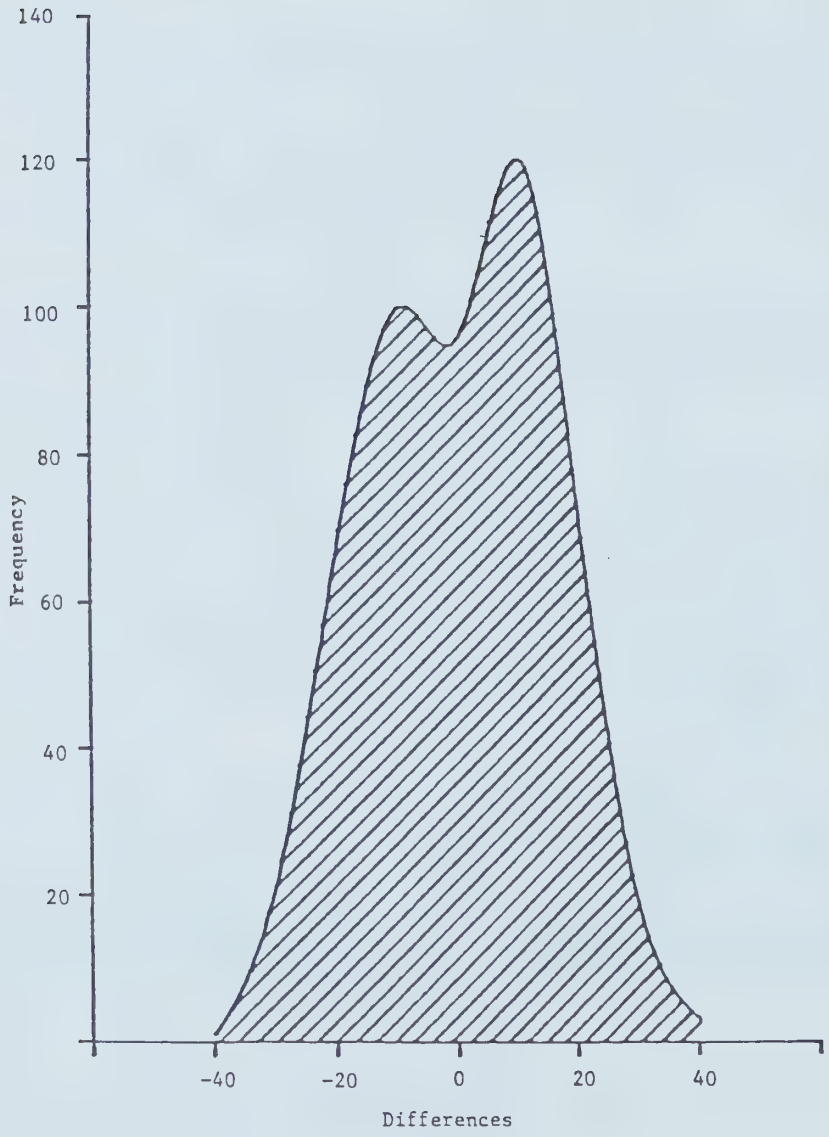
The distribution of differences between interquartile distances shows that when the null hypothesis is true (i.e., the interquartile ranges are equal) the empirical sampling distribution falls between -40 and +40 points. Ninety-five percent of the differences between interquartile ranges are less than 28 in absolute value. This suggests that the observed difference in interquartile differences (23) is not significantly different from that which we would expect by a random allocation of scores to classes.

There is not likely a statistical test for the significance of the difference between interquartile ranges. Indeed, for many statistics that are useful in data exploration, standard inferential strategies are unavailable. The randomization or permutation test provides the researcher with a conceptual tool for testing hypotheses in such circumstances. The hypothesis—that the observed result differs systematically from a random allocation of data—often provides a useful base from which results can be evaluated.

Display 9
Bootstrap Correlations



Display 10
Distribution of Differences Between Interquartile Ranges for Classes 6 and 7



Conclusion

The field of statistics has not been stagnant. There are many new developments, but the most important ones to educational researchers are those that encourage people to custom design their analytical strategies to fit the problems under investigation. These are tools to be used to find patterns, to spot important exceptions, to add strength to hunches and to confront researchers with the inadequacies of their theories. The aim of this paper has been to bring some of these developments to the attention of researchers and to encourage them to examine both the strategies and the philosophy behind them more carefully.

Note

1. Parts of this paper are based on the author's McCalla Research Professorship Lecture, January 31, 1985.

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student evaluation as stated in Recommendation 4 (p. 49). If the recommendations of this report can filter down through the administration morass to the district and, more importantly, the school and teacher level, so that action can be taken to include all the players including students, parents, and prospective employers, perhaps both the educational and public perception problems associated with student evaluation can be approached and solved in a rational and constructive manner (see particularly Recommendations 1 and 2).

I was slightly disappointed in that there were no recommendations directed towards teacher training institutions and preservice education of teachers since many statements in the report seemed to indicate weaknesses in these areas. However, for the strong and positive recommendations that it does contain, this report is to be highly recommended and Dr. McLean should be commended!

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PREPARATION OF MANUSCRIPTS

1. All manuscripts must be typewritten, double spaced, and submitted in triplicate and are not to exceed 25 pages in length.
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3. The author's name and affiliation should appear only on a separate title page to ensure anonymity in the reviewing process; the title of the paper should appear on the first page of the manuscript as a means of identification.
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